Gas Journal

NOVEMBER 21, 1934

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Editorial Notes

Reorganization of Research

On Thursday, Nov. 8, the new Scheme of Research and Technical Organization of the Institution of Gas Engineers came into being. We said good-bye to the General Research Committee and the various Sub-Committees as hitherto constituted. Requirements to-day differ from those obtaining a few years ago, and the Council of the Institution feel that by the new arrangement there will be better direction of research work and more effective use of the funds available.

The new scheme was outlined in the swan-song Report of the General Research Committee presented at the Autumn Research Meeting of the Institution. Among other things, it provides for the appointment by the Council of an Advisory Committee on Research, a Research Executive Committee, and a Technical Assistant Secretary. The Advisory Committee comprises representatives of the National Bodies, Government and University Fuel Research, Chairmen of Research Committees, the Livesey Professor, and "others having a special interest in research." The Research Executive Committee consists of nine members of the Institution, and is appointed by the Council.

The Advisory Committee is simply to guide the Executive Committee, and responsibility for details of research, personnel, finance, or organization will rest with the nine members of the Executive. On the advice of the Executive the Council will, if thought fit, appoint special "subject" Research Committees. The Executive Committee will keep close watch on the administration, conduct, and finance of each investigation of the "subject" Committees. Appointments on the Research Staff will be open to candidates from any quarter. It will be gathered that the Research Executive Committee is a highly important body, and that its nine members have no light task. Mr. F. P. Tarratt is Chairman of the Committee, and the other members are Mr. E. V. Evans (Vice-Chairman), Mr. H. C. Smith (Hon. Secretary), Mr. Thomas Hardie, Mr. Stephen Lacey, Mr. H. D. Madden, Dr. E. W. Smith, and Mr. John Terrace, while one vacancy remains to be filled. The Secretary is Mr. J. R. W. Alexander.

We are glad that the Joint Research Committee of the Institution and Leeds University will remain, and will carry out such work as is given to it by the Executive Committee. The close co-operation between the Institution and Leeds University has been a source of great strength to our Industry; and the joint researches made have without question improved the efficiency of gas-works practice generally and the performance of gas-using appliances. They have, too, laid an admirably solid foundation for future investigations. Also—and perhaps this is even more important—the co-operation has resulted in the recruitment into the Industry of an army of men specifically trained technically to further the progress of gas. The joint research has raised the status of the Institution, and Leeds training has in no small measure helped to raise the standard of the Industry's personnel.

We regard the new research and technical scheme of the Institution as being full of possibilities for advancement. The Institution was early in the field with organized "investigation" research, and those responsible for the working of the new plan have the benefit of past experiences.

A Clearer Outlook

The reorganization affords an opportunity for a clearer outlook by the Institution on research in general, and, we suggest, modifications in several ways. Conditions to-day are vastly different from those obtaining when the Institution first started its research programme. Since then the laboratory facilities of the larger undertakings have been increased enormously. These laboratories have been equipped at an expense thoroughly justified, but quite beyond the reach of the laboratories of any department of a university. Apparatus has been installed capable of the nicest precision, and technical staffs, with either university or equivalent training, have been built up able to manipulate this apparatus, and also to interpret the results of their findings in terms of works or district practice. We have in mind "utilization" laboratories, such as at Watson House, where what we

may term " investigation research " on appliances, and so on, can be carried out more speedily and to greater effect than in any university laboratory. The same reasoning applies to investigation research on the various processes of gas making and the manufacture of bye-products.

Through joint research with the University of Leeds, the Institution has gathered a vast amount of accurate data on plant performance and on standard methods of test, and all this information can now be applied by large undertakings to the benefit of the Industry in general—and, we suggest, applied more effectively than by any other mode of procedure. As to the lines on which the Research Executive Committee might proceed. First, it would be a good plan to collate all the information from the various investigations on plant and appliances so far carried out by the Joint Research Committee and others, to summarize this information, and let it act as a starting-point for the larger undertakings. Such a summary would obviate overlapping of work. We believe that the results of their investigations would willingly be put before the Industry, via the Institution, either yearly at its Research Meetings, or at other times. The universities would be able to concentrate upon their chief functions—the training of youth destined to come forward into the ranks of the Industry, and the carrying on of " pure " research. Pure research is every bit as important as the more obvious investigation research, and the university laboratory is the place for pure research. There the workers, untrammelled by immediate practical problems, can carry on their researches under skilled direction.

An Essential Difference

We think that so far the Gas Industry of this country has been apt to ignore pure research, and confuse investigation research with true research. There is every reason why the Institution, through its Research Executive Committee, should pay more attention to pure research—and not necessarily that carried out in any one Laboratory. And consideration might well be given to the allocation of part of the funds in furthering pure research likely to be of value to the Industry, but which, through lack of funds, is languishing, or has even been discontinued.

We regard this recognition of the essential difference between investigation research and pure research as a vitally important point in the future programme of research for which the Institution of Gas Engineers is responsible. *We do not in any way suggest limitation of investigation research*, for there are so many problems which call to be solved. Their solution will, however, we think, be largely the result of work undertaken by the larger undertakings, either themselves on an understanding which prevents overlapping, or in collaboration with, and with the support of, smaller undertakings, as in the laboratories of the Industrial Development Centres to-day.

The Research Meeting

Now let us turn to the Research Meeting itself, which by one and all was hailed as an outstanding success. A dominant impression was the continued popularity of the reports of the Liquor Effluents and Ammonia Sub-Committee—now, we take it, a " subject " Committee. Right from the start this Committee realized the great value of co-operation with those responsible for the treatment of trade wastes. There has grown up during the time the Committee has been in existence a friendly feeling between local authorities and the Gas Industry which has been of the utmost benefit in the removal of many obstacles in the disposal of effluents and liquor. Throughout, the Committee has wisely sought advice and assistance from workers in fields which might be thought remote from the problems of the Gas Industry. We instance the assistance given by Dr. Happold, of the Department of Pathology in the University of Leeds. The Committee is a " human " one, and it has undoubtedly brought about a greater appreciation of research work jointly undertaken by the Institution and Leeds University, through the advice it has so constantly given to individual undertakings and authorities, who more and more ask for its aid. Another example of the value of co-operation in this type of work is provided by the report of the Refractory Materials Joint Sub-Committee.

Throughout the meeting the discussions were of a high standard and should prove of much value to the research staff of the Institution. The discussion on the work carried out by Mr. Wood on the corrosion caused by products of combustion of gas is a case in point. In that discussion reference was made to similar work by the Gas Light and Coke Company into the effects of a reduction of sulphur compounds in gas far greater than dealt with in Mr. Wood's report. There may be sound reasons for carrying out experiments on gases containing as much as 50 grains of sulphur per 100 c.ft., but there are surely still sounder reasons for experiments on gases with a sulphur content below 25 grains. In this regard the speed at which the larger undertakings can carry out investigations renders such researches far more flexible. Work can be switched on to another line without loss of time.

Finally, an innovation which proved highly successful was the general discussion on gas research and investigation, and we are glad that this plan is to be adopted at future research meetings. The meeting on Wednesday, Nov. 6, 1935, will afford members an opportunity of discussing the results of the first year's working under the new scheme of Research and Technical Organization.

Birmingham's Class A Lighting

In our News Columns last week we published a photograph of the Lord Mayor of Birmingham inspecting a gas installation in what are claimed to be the best lighted streets in the world—New Street and Corporation Street, Birmingham, the City's two principal thoroughfares. On later pages to-day will be found an illustrated description of this remarkable installation—unique in several respects—which falls within Class A of the B.S.I. Specification for Street Lighting. It was fitting that the first public function of the new Lord Mayor should be inspection of this splendid example of modern gas lighting—an example which will redound to the credit of the Gas Industry throughout the land.

It is obvious from our article, written by Mr. R. G. Marsh, of the Birmingham Corporation Gas Department, that the installation entailed an enormous amount of work " behind the scenes " in obtaining the necessary permission from the landlords, lessees, sub-lessees, and tenants concerned for the fixing of the necessary anchorages for the overhead cables. Also, as we have mentioned, the two thoroughfares dealt with are the most important in the City. The traffic conditions, both pedestrian and vehicular, are extremely congested during all hours of the day, and it was only possible to carry out on Sundays or after midnight the large amount of work

required to lay services, fix control pits, and so on, and run the supplies up the shop fronts to the positions of the lamps on the cables.

The installation exemplifies the value of co-operation between gas undertaking and makers of equipment. The lamps, which operate at a pressure of 9 in. of mercury, are of a new and special design employing a delayed-action automatic air regulator valve which allows gas only to be admitted to the burners during the first few seconds of lighting, and gas only during the last few seconds before extinguishing. This prevents lighting-back troubles. Again, as far as we are aware, this is the first time that a pressure as high as 15 lbs. per square inch has been dealt with by clock controllers. How the difficulty of coping with such a pressure was overcome by the makers of the controllers in collaboration with the Gas Department makes interesting reading.

As will be seen from the photographs accompanying the article by Mr. Marsh, the installation constitutes magnificent propaganda for gas, and all concerned with its conception and fulfilment deserve the thanks of the Industry.

Selling Street Lighting

We have emphasized before in these columns on more than one occasion the great benefit to be gained by gas undertakings setting up trial stretches of street lighting with the object of demonstrating to authorities what gas can do in this direction. Insurmountable difficulties, however, are frequently put in the way of enterprising undertakings, even if they are willing to show how well gas can perform this service, by local authorities, who are either so short-sighted, or so biassed in favour of other forms of illuminant, that they will not allow gas a fair trial, though without cost or obligation to themselves. For this reason we would commend to the Industry the idea recently put into practical application by the Wandsworth and District Gas Company, and referred to in detail on another page of this issue.

The scheme is, briefly, that the Company have turned a short stretch of roadway on their works into a permanent " showroom " for street lighting fittings. Here there are no fewer than eleven different types of lamp—products of leading firms in the Industry—comprising ten column fittings (one of these being high-pressure) and one central suspension series, the latter complete with raising and lowering gear. Each series is made up of five lamps in staggered formation (except, of course, the central suspension lamps) at 150 ft. intervals, and each series differs from the others in respect of number of burners, design of lantern, type of reflector, mounting height, and so on, while various methods of control are also exemplified.

It will thus be appreciated that any desired type of illumination may be switched on at will and compared with any other type, so that a public lighting authority may make a selection of the method of illumination most suitable for the requirements of any particular thoroughfare from arterial road to back court or stairway. It is possible, in addition, by such means to make useful tests of the various methods of lighting under identical conditions, and thus obtain valuable information on the behaviour of the different types of lamp.

Almost any works with 200 yards of more or less straight roadway could adopt this system, while enterprising firms of lamp manufacturers would probably be only too glad to co-operate in such an effort to stimulate greater interest in public lighting. There should then be little difficulty in convincing the *unbiassed* lighting authority that gas is the only thoroughly reliable and completely adaptable agent to perform any kind of public lighting from Class A to Class H—and this at the lowest possible charge on the rates compatible with such a service.

An Industrial Lighting Problem

The old adage that things are not always what they seem was well exemplified in connection with a paper which was read before the recent meeting of the Illuminating Engineering Society in London by Mr. R. W. Daniel, one of H.M. Inspectors of Factories, who dealt with some of the factory lighting problems in Sheffield. An outsider seeing the illustrations to this paper would immediately get the impression that in the large majority of workshops at any rate, if not factories, in the Sheffield area no progress in the matter of lighting has been made since the days of the batswing burner and even the flame at the end of an open pipe. It was indeed a gloomy picture which the author set before his audience, and it is to be hoped that he does not intend this to be taken as typical of what Sheffield in general is doing. Indeed, we are sure he does not, but the fact remains that, quite unintentionally, Mr. Daniels did gas something of a disservice. It must at the same time be stated that he did not exactly compliment our electrical friends, for quite a number of cases were illustrated in which electric lighting similarly has made no progress since the very early days.

Taking gas lighting, however, Mr. Daniels showed his audience a large number of slides of workshops, as distinct from factories, in which gas lighting is used through the medium of arms over the work place with several joints, so that the so-called light can be moved from point to point, but making use either of an open flare or a batswing burner. Such illustrations, with the explanations made by the author, however, give an entirely erroneous idea of the facts, and it was as well that Mr. A. Wylie, of the Sheffield Gas Company, was present to give the real explanation, to which we think the widest possible notice should be given.

There is an industrial condition of affairs in Sheffield which probably does not apply in any other area in the country. If it does, then the explanation of the true position is the same. In the cutlery industry, for instance, it is the practice for operators to rent a room in a tenement building of distinctly antique origin, such buildings being, in Mr. Wylie's own words, obsolete in design, wanting in ventilation, and devoid of natural light. These operators may employ a few men to work for, and with, them, and short of complete demolition—which to some of us who have the good fortune not to have to earn a livelihood at this class of work would seem the best way in the end—it will pass the wit of man to apply modern artificial lighting to such tenement buildings. That, however, is not the complete explanation of the truly appalling state of affairs which was stressed by Mr. Daniel. The use of flares and batswing burners will probably continue for a while in many industrial operations because the constant vibration in some of these places is such that no incandescent gas burner or incandescent electric lamp can stand up to it. As a matter of fact, experiments are constantly being made to introduce a flexible incandescent gas light for such purposes, but it has to be admitted that there is still no known substitute for such fittings as a flare or a batswing burner in close proximity to such machines, for example, as a steam hammer or heavy overhead gear, to take two extreme examples.

The Gas Industry is aware of the progressive policy of the Sheffield Gas Company, and apropos of the em-

phasis placed during the meeting in question on the importance of maintenance by the lighting authority wherever possible, it can be stated that the Company has a maintenance scheme which is operating in respect of a large proportion of the factories in their area. It is also pleasing to note that with improving trade there is an indication that the endeavours of the Company to interest these establishments in the matter of improved lighting have not been in vain. The human element, however, in existing conditions is a distinct barrier to progress. For instance, what is to be done in the case of an old operator some 70 years of age who insists on working with a 100-watt clear globe electric lamp 3 inches off the point of his cutting tool?

There may or may not be a rush of lighting engineers to Sheffield as a result of the direful state of affairs pictured in Mr. Daniel's paper, and we wish them all possible luck. But we could not believe, even if we did not know otherwise, that what was shown us on the occasion mentioned is typical of Sheffield factory and workshop lighting, and we wish Mr. Daniel had shown us something of the other side of the picture as well. Undoubtedly, however, a good purpose has been served by the paper, and it all lends weight to the demand in some quarters for standard lighting regulations which can be more or less enforced in the interests of the workers themselves, however obstinate or conservative they may be. The Committee of the Home Office which investigated factory lighting conditions in 1915 made such a recommendation, as did a previous Committee, but so far nothing has been done. We do not need a complicated code of Government rules, but a few simple recommendations might well re-inforce the efforts of those who, like the Sheffield Gas Company, are anxious to improve conditions.

Competitive Cooking

REFERENCE was made in these columns last February to some of the results of important comparative tests between gas and electricity for domestic cooking. These tests were arranged by the Gas Light and Coke Company with the Good Housekeeping Institute, and were carried out by four members of the Institute's Staff under the supervision of Mrs. D. D. Cottington Taylor. The results of these tests have now been summarized in booklet form, published by the Gas Light and Coke Company and obtainable through the British Commercial Gas Association.

We have already examined the findings in some detail and have published some of the more valuable facts and comparative figures, so that it is only necessary here to refer briefly to the booklet just published—which is attractively and clearly set out and is entitled "This Cooking Question." It will be remembered that Mrs. Cottington Taylor took for the investigations three pairs of gas and electric cookers, each pair in a different size to cater for families of three, five, and seven persons respectively. The cookers were all of different makes, representing types of appliance in general use. The investigators allowed themselves 10s. per head per week for food, and the whole value of the tests lies, of course, in the fact that they were entirely impartial. The actual menus chosen are included at the end of the booklet, and these show plenty of variety, while being simple ordinary meals such as would be arranged by a busy housewife with little time to spare. The booklet then sets out to answer these three questions: (*a*) Which is more convenient? (*b*) Which is quicker? and (*c*) Which is cheaper?

The statements show that the Good Housekeeping Institute have proved clearly enough that on practically every count gas is better than electricity for cooking, and it is undoubtedly cheaper. It is remarked that gas at 8$\frac{3}{5}$d. per therm is cheaper than electricity at $\frac{1}{2}$d. per unit *without* any additional standing charge, while with electricity at 1d. per unit *without* standing charges the cost of electricity cooking will be a little more than double that of gas at 8$\frac{3}{5}$d. per therm. Emphasis is laid on the value of the more accurate heat control obtainable with gas, while it was found that gas was a little quicker on the average, most of the time being saved over meals that are wanted quickly—an excellent selling point in these days when life is being lived at a higher speed than ever before.

The results set out so conclusively in this booklet confirm the superiority of gas for cooking already realized by the Gas Industry, and thanks are due to the Gas Light and Coke Company for making the facts available, in useful form, to every undertaking. Since the superiority is equally recognized by so overwhelming a majority of the public, we suggest that gas undertakings will not wish, in ordinary circumstances, to broadcast the publication to the millions of satisfied cookers-by-gas. They will, however, no doubt serve it out as excellent ammunition to members of the sales staffs, and will hold a broadcast in reserve to help in meeting any particular "electricity for cooking" campaign which may arise.

Forthcoming Engagements

November

23.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. T. G. Noble.

24.—N. OF E. AUXILIARY ASSOCIATION.—Half-Yearly Meeting at Newcastle. Paper by Mr. W. O. Kirkwood.

24.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION. Meeting at Swansea. Paper by Mr. F. Stuart Johns.

30.—SOUTHERN ASSOCIATION.—General Meeting, Hotel Metropole, London, 2.30 p.m.

December.

1.—WESTERN JUNIOR ASSOCIATION.—Meeting at Taunton. Paper by Mr. D. H. Sullivan.

3.—GAS COMPANIES' PROTECTION ASSOCIATION.—Meeting of the Committee at 5, Victoria Street, S.W. 1, 2.30 p.m.

5.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Visit to Messrs. Donald Macpherson & Co., Ltd., Knott End. Paper by Mr. Lowe.

8.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Meeting. Paper by Mr. J. Bateman.

13.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board, at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.

13.—S.B.G.I.—Council Meeting, 2.30 p.m.

14.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting and Paper by Mr. G. P. Manning.

15.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION. Meeting at Cardiff. Paper by Mr. G. S. Leonard.

15.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting in Sheffield. Presidential Address of Mr. R. Halkett, Jun.

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Page 34. HORNSEY. K. Gandon, E. & Dist. Sup., resigning.

Page 50. NORTH MIDDLESEX. K. Gandon appointed E. & G. M. vice L. Trewby, retiring.

Personal

It is given to few men in these days to be able to claim that they have served their employers over half a century without a break. Mr. J. J. ROUTLEDGE, who has just retired on reaching the age limit of 65, entered the employ of the Carlisle Corporation Gas Department when 14 years of age as an apprentice fitter. He has served under no fewer than six Managers. When he entered this Department Mr. Joseph Hepworth was the Manager of the Gas and Water Undertaking. Subsequent Managers have been Mr. C. B. Newton, Mr. W. J. Smith, Mr. Harold E. Bloor, Mr. E. G. Hutchinson, and Mr. J. E. Blundell, the present Engineer and Manager.

Mr. Blundell last week made a presentation on behalf of his fellow employees to Mr. Routledge on his retirement. Prior to this function a neatly-framed resolution of thanks, suitably engrossed, from the Gas Committee was also handed over to Mr. Routledge. This with the city's coat of arms and motto at the head, "Be just and fear not," sets forth that at a meeting of the Gas Committee held at the Town Hall on Friday, Oct. 5, 1934, the Gas Engineer referred to the retirement of Mr. J. J. Routledge, whereupon it was resolved "that this Committee desire to place on record their high appreciation of the ability, zeal, and thoroughness displayed by Mr. John James Routledge, Distribution Superintendent, in the discharge of his duties during his 51 years' service with the Carlisle Corporation, and to express to him their best wishes on his retirement."

The gift from his fellow employees consisted of a gold hunter watch bearing an inscription. Mr. Blundell made the presentation, and Mr. W. Creighton, of the Highways Department, and Mr. J. Birkett, Chief Clerk, added their expressions of appreciation and endorsed the warm tribute paid by the Manager to the recipient.

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From Canada we have news of the election of Mr. ARTHUR HEWITT as President of the Consumers' Gas Company of Toronto. The *Toronto Mail and Empire* rightly observes that this honour "is a fitting reward for a service which he began as a very young man nearly half a century ago." We feel sure that the Members of the Institution of Gas Engineers who visited Canada and the United States in the autumn of 1933 and others who have had the pleasure of meeting Mr. Hewitt would wish to be associated with us in congratulating him upon being honoured with this important position. The Presidency was rendered vacant by the death of Mr. A. W. Austin some months ago.

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Councillor R. H. HUME, Chairman of the Birmingham Gas Committee, has been elected an Alderman of the City Council, of which he has been a member since November, 1920. He is a Director of Coxson, Gerrard, & Co., Ltd., manufacturing chemists, of Oldbury.

* * *

After more than thirty years' service as Engineer and General Manager of the North Middlesex Gas Company, Mr. LAWRIE TREWBY is retiring from this position, and has been elected to a seat on the Board of Directors of the Company as from Jan. 1, 1935. Mr. Trewby received his early training in the Engineering School of the University College, London, under Prof. Beare, subsequently spending a year at the Beckton Gas-Works during the period when Mr. Methven was Engineer-in-Charge there. He was later articled to Mr. A. Colson, at Leicester, afterwards becoming Assistant at the Aylestone Road Works, succeeding Mr. F. P. Tarratt, now of Newcastle, who at that time was appointed to Darlington. Mr. Trewby took up his position with the North Middlesex Company in 1902.

* * *

The position of Engineer and General Manager of the North Middlesex Gas Company, rendered vacant by the retirement of Mr. L. Trewby, has, we learn, been filled by the appointment of Mr. KENNETH GANDON, Engineer and District Superintendent of the Hornsey Gas Company. Mr. Gandon received his early training in the Industry as an Articled Pupil to Mr. S. Y. Shoubridge, at the South Suburban Gas Company. He was subsequently appointed Junior Assistant to the Bath Gas Company, where he served ten years, at the end of which time he was Assistant Engineer and Manager. Leaving Bath in 1925 he became Assistant Engineer and Manager to the Hornsey Gas Company, under Mr. J. W. Buckley. Two-and-a-half years ago, on Mr. Buckley's retirement, Mr. Gandon was appointed Engineer and District Superintendent of that Company. His father, Mr. John Gandon, was for many years Engineer and Manager of the Ottoman Gas Company, Ltd.

Obituary

I. H. MASSEY.

It is with regret that we announce that Mr. Isaac Hibbert Massey, of 29, Abbeyhills Road, Oldham, died on Nov. 12, following a long illness. Mr. Massey, who was 63 years of age, was the Oldham Corporation Lighting Superintendent and he had a record of 52 years' service.

In 1917, Mr. Massey became Distribution Superintendent, and he occupied that position until he was appointed Lighting Superintendent in 1924.

In addition to many other activities Mr. Massey was Treasurer of the Manchester and District Junior Gas Association until a short time ago.

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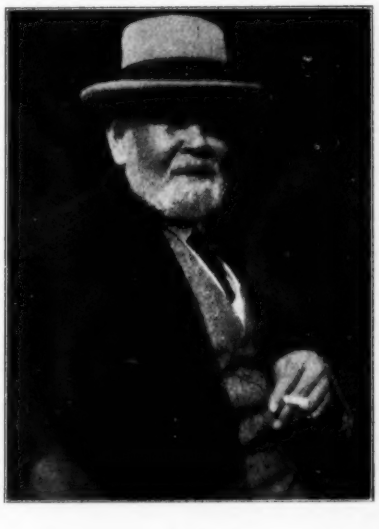
The death occurred on Nov. 9 of Alderman C. H. BOWERS, J.P., who was for some years Chairman of the Gas Committee of the City of Stoke-on-Trent, and was later Vice-Chairman of that Committee.

"OLD LAMB."

To the notice which we gave last week of the death of Mr. F. H. Lamb, we are pleased to be able to add an appreciation by an old friend:

To claim a friendship for almost fifty years, and during that long period never to have had an unkind word, is a pleasant retrospect in the time of stress and struggle that surrounds us to-day, and together with many others I mourn the loss of our old acquaintance F. H. Lamb.

We laid him to rest last Wednesday with the sun shining overhead, which seemed befitting to the occasion. He was essentially pre-war in his nature, yet he was able to tune-in his temperament to the altered conditions that now obtain, and our Industry has lost one of its best known personalities, for there must be few who were not acquainted with him.



His perky smile was always apparent, and he was ever busy in trying to oblige someone else; for in the old days at our meetings we used to "park" our ladies in his care, when duties made their presence undesirable. Many "Derby" days have I seen him leave with his bevy of beauty for Hampton Court or other equally popular resort, and even our Press has reproduced photographs of such occasions. And, if the evening was quiet, he was one of the first to organize some amusement.

He will therefore be missed by our ladies, to whom, like ourselves, he was known so well as "Old Lamb." He was seldom absent from our meetings, for his love was for our Industry, and as we must all pass along when our time arrives, we shall be lucky to leave behind as straight a course, and such a kindly memory, as "Old Lamb."

I feel I am expressing the thoughts of many friends in tendering to his widow and family our deep sympathy in their sorrow.

W.

Correspondence

Shareholder Co-Operation

SIR,—I have, during recent years, observed with interest and admiration the measures taken by the ruling bodies of the Gas Industry, and also by individual undertakings, to bring home to the general public the potentialities of gas as a domestic fuel.

Very much has been done in this direction, but one important possibility has been overlooked. The co-operation of the many thousands of individuals who own gas company stocks has never, as far as I am aware, been enlisted.

As stated by Sir David Milne-Watson in the course of a recent speech, the aggregate sum invested in the Gas Industry of the country exceeds £200,000,000. Of this sum, roughly £131,500,000 represents the capital subscribed to gas companies by investors. (At current prices, this investment is valued at a very much higher figure.)

It is safe to assume that this vast sum of capital is owned by not less than 100,000 individuals. To what proportion of these people has the thought ever occurred that they can not only safeguard, but possibly even enhance the value of their property by using more gas and recommending their friends to do the same?

I suggest that, if gas company stockholders were, in the first place, properly instructed on the subject, and, secondly, brought to realize the fact that they can easily, by their own efforts, serve their own interests, a very important step forward would be achieved at a very low cost.

The cost of a series of well-written, attractive circulars addressed to stockholders *qua* stockholders would be small and, in my opinion, money spent in this way would ultimately produce infinitely better results than the same amount spent on even the cleverest Press publicity.

Meanwhile, judging by my own personal experience, there must be many thousands of gas stockholders who do not themselves yet know of many of the uses—refrigeration and garage and greenhouse heating, for examples—to which gas may profitably be put.

Yours, &c.,
HENRY S. LOEBL.

148, *Leadenhall Street,*
London, E.C. 3,
Nov. 16, 1934.

Glass Silk Insulation for Flat Surfaces

SIR,—The writer has noted that in your issue dated Oct. 31, 1934, in discussion on "The Application of Town Gas to Industrial Heating Problems," glass silk was mentioned, and it was suggested that although the high efficiency of this material was undoubted, it could not readily be adapted for flat surfaces (pages 371-2).

This Company specialize in the supply and fixing of this type of insulation, and we have not any difficulty in its application to flat surfaces; it is, in fact, more easily fixed than any other insulation in slab form. We have supplied to one order alone upwards of sixty tons, representing 66,000 sq. ft. of "Versil" insulation, which have been fixed by our customer on air heaters, economizers, and bunker casings—all flat surfaces. As we have received repeat orders from this customer for our material, and have also carried out a number of similar applications, we cannot agree that this type of insulation is unsuitable.

The fact that flat surfaces are common in gas-works and in industrial gas appliances does not in any way limit the application of our product.

Yours, &c.,
C. E. BINNS,
Managing Director.

Versil, Ltd., Engineers and Contractors,
Cheapside Chambers, Bradford,
Nov. 17, 1934.

News In Brief

New Gas Showrooms are to be erected for the Ossett Gas Department, and tenders for the work are being invited by the Town Council.

Application is to be Made by the Hessle Gas Company for an order under the Gas Undertakings Act, 1929, to raise further capital by the issue of £16,000 additional stock and by borrowing £8,000 in respect thereof, and for other purposes.

An Extension of the Limits within which they are authorized to supply gas is among the powers sought by the Romford Gas Company in a special order for which they are shortly to apply to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934.

A Three-Lift Spiral Holder is in the course of erection at the City of Limerick Gas-Works. When completed it will have a capacity of 450,000 c.ft. This forms part of an improvement scheme which it is hoped will result in an annual saving of about £2,000.

A Change of Calorific Value is announced by the Windermere Gas Department to come into operation as and from April 1, 1935. They intend to supply gas of a calorific value of 475 B.Th.U. gross per c.ft. in substitution for the quality of 500 B.Th.U. now being supplied.

The Utilization of Coke Oven Gas was recently discussed by representatives of the Workington Corporation Gas Department and the Workington Iron and Steel Company. The Committee adjourned further consideration of the matter until additional particulars had been obtained.

In the Broadcast Talks in the National Programme, entitled "At Home To-day," Radiation, Ltd., were asked to contribute an item on "How to Use your Gas Cooker." One of their demonstrators (Miss J. C. Arnold, M.C.A., N.S.T.C., Domestic Science Diploma) broadcast the talk on Nov. 15, describing the great advantages pertaining to the modern gas cooker with automatic oven-heat control and gave some hints on gas cookers generally.

Applications are Invited for the position of Assistant Engineer and Manager to the Borough of Rochdale Gas Department. The commencing salary is £400 per annum.

In the Souvenir Programme issued in connection with the Coming-of-Age Celebration of the L.C.C. Evening Institutes, at the Royal Albert Hall on Nov. 10, we were interested to notice an article by Sir Francis Goodenough, C.B.E., who is Chairman of the Committee responsible for the Engineering and Art School sides of the Westminster Technical Institute, at which there are over 1,000 gas students.

A Special Order under the Gas Undertakings Acts, 1920 to 1934, is to be sought by the Sowerby Gas Department to provide that all money received by the Undertaking whether on capital or revenue shall be carried to the general rate fund of the Urban District of Sowerby, and that all payments made shall come out of the same fund. Other powers in connection with accounting, expenditure of surplus revenue, and provision for regulation of gas charges are also sought.

An Exhibition of cooking and heating appliances, with demonstrations by Miss E. Sanderson, of Radiation Ltd., twice daily, was held by the Bradford Corporation Gas Department at their showrooms at Britannia House, from Nov. 12 to 16. The exhibition and demonstrations attracted much interest in the City and district. The crowds at the demonstrations became so big that amplifiers and loudspeakers had to be fixed so that all could hear the comments of the demonstrator.

First Prize and a Silver Cup were obtained by the Minehead Gas-Light and Coke Company for their entry in the Alcombe and Minehead Carnival. This is the second year in succession that the Company have won this award. A feature of their display, which was built upon a lorry, was that it was lighted from compressed gas cylinders, while by means of an ingenious pump device, a geyser was shown pouring out hot water continuously.

Investigations of Fire Grates, particularly those suitable for burning coke, have been made by the Manchester and District Regional Smoke Abatement Committee. In the annual report of the Medical Officer of Health for the City, it is stated that several excellent types of fire grates have been placed on the market by manufacturers and gas undertakings who were giving a large amount of publicity to them. In this way, and by the increasing use of gas and electricity for both domestic and industrial purposes, good progress was being made towards a cleaner atmosphere.

Thermostats.—An informal discussion on thermostats was held by the Institute of Physics on Tuesday evening, Nov. 13, in the Science Museum. The opening speakers were Professor A. V. Hill on "Precision Thermostats," Mr. L. G. Carpenter on "Thermostats for use at moderate temperatures," and Dr. J. L. Haughton on "Thermostats for use at high temperatures." Sir Henry Lyons, the President of the Institute, was in the Chair. After the interval the meeting re-assembled for what proved to be a lively and interesting discussion on the merits of various types of thermostats.

The Institution of Mechanical Engineers.—Mr. W. H. Johns, M.I.Mech.E., M.Inst.Gas E., Engineer and Manager of the Swansea Gas Light Company, who is Chairman of the South Wales Branch of the Institution of Mechanical Engineers, delivered an Address on "Mechanical Equipment of Modern Gas-Works" before that Branch at Swansea on Nov. 13. The object of Mr. Johns' Address was to illustrate the extensive part mechanical engineering plays in modern gas manufacture and the various mechanical plant that is used in the different processes. The Address was illustrated by about 80 lantern slides.

"British Empire Trades Index."—We have received the new 1934-5 edition of the "British Empire Trades Index." This publication is a valuable buyers' guide to leading manufacturers, producers, and distributors of the British Commonwealth. This work is divided into three sections. The first of these sections contains some 40,000 firms representative of the whole Empire grouped under 4,399 separate trades. The second section gives a complete alphabetical list of all the firms mentioned in section one with cross reference to the numbered classifications under which their entries appear. The final section gives several thousand trade marks and brands followed by the full name and address of the owners.

Belgium and Gas-Driven Vehicles.—The Belgian Association of Gas Engineers in its Report for 1933 mentions that consideration was given during the year to the question of the utilization of gas as a fuel for motor vehicles. The decision arrived at, however, states that there was little possibility of development in Belgium, owing to the fact that engine users were somewhat conservative in their ideas and that supplies of compressed gas are not generally available in the country. In addition, it was felt that having regard to the widespread use of petrol, heavy oil, and "Mazout," which latter is at present available at very low prices in Belgium, gas is placed in a poor position to compete even when offered at bare cost price.

A Pioneer of Gas Lighting.—Interest has lately been taken in the early history of gas in Preston by the display in the Harris Museum of a portrait of Father Joseph Dunn, the pioneer of gas lighting in Preston. The original was painted from life by a local artist for the Preston Gas Company, who permitted a replica of the portrait to be made for the permanent collection at the Harris Art Gallery. Father Joseph Dunn, who was Rector of one of Preston's churches for over 50 years, was about 70 years of age when, as the result of his activities, the Preston Town Commissioners signed the first contract for street lighting on Feb. 20, 1816. He had made many experiments with gas and gas lighting in his spare time for nearly a quarter of a century, and was so convinced of the public benefit of the new light that he over-rode all opposition.

Institution Discussion.

In his reply to the discussion on the Report of the Liquor Effluents and Ammonia Committee at the Institution of Gas Engineers Research Meeting (p. 523 of last week's issue), Mr. C. F. Botley is reported to have said, "... recommendations by Mr. Holton and Mr. Hollings and Dr. E. W. Smith ..." Mr. Botley writes to point out that if he used the name of Mr. Holton he was unconscious of the fact, and it is inaccurate.

Gas Department Dinner at West Bromwich.

Presentation of Long Service Certificates.

Long service certificates were presented to twenty-two employees of the West Bromwich Gas Department at the Department's First Dinner at the Sandwell Hotel on Nov. 8 last. In addition there were certificates for seven more men who were unable to attend. The aggregate years' service of the men is over a thousand.

Mr. J. Hunter Rioch (Gas Engineer and Manager) extended a very cordial welcome to Councillor C. B. Adams on what would be his last public function as Mayor of the Borough, and to Alderman Cox and the members of the Gas Committee. He assured them that they very much appreciated their support and interest in the Department's social welfare. The certificates, he hoped, would find prominent places in the homes of the recipients and remind them of their long and loyal service in the cause of a great Industry. It was his wish to have a real live social club in the Department. It was just as necessary for them all to come into contact with each other in a social capacity, because to-day, perhaps more than ever, it was realized by all leaders of industry that the social welfare of the employees was a very important matter. It was by realizing and appreciating each others' difficulties that they could bring about that very desirable state of things called co-operation, and it was only by team work that any business could succeed.

The toast of "Those we Serve" was proposed by Mr. W. T. Coleman, who said the Gas Industry to which they were not only privileged but proud to belong, was an Industry second to none in its utility and service to the nation. That gas was more extensively employed to-day than ever before was proved by the remarkable annual increase in sales. "In our own Undertaking," he went on, "growth is shown by the fact that in 1880-1881 the total gas output was 126 million c.ft., whereas the output for the year ended March, 1933, exceeded 515 millions, an increase of over 400%, and the latest figures to hand show a further increase of over 22 million c.ft.—a magnificent achievement. There are 150 employees engaged in the works and distribution departments, many of whom have years of continuous service, evidence of which you see by to-night's presentations. In our area of supply there are nearly 20,000 consumers of gas, and approximately 27,000 tons of coal are carbonized annually."

Response was made by Councillor Adams, who said it was not the Committee they served, but the gas consumers of West Bromwich. From those 20,000 people they got very few complaints indeed, and this brought home vividly the fine service rendered by the Department.

The long-service certificates were then presented by Alderman Cox, and acknowledgment was made by Mr. J. A. Davis and Mr. J. S. Bingham.

An Attractive Gas Fire Setting.

The above exceedingly attractive setting was recently executed by the Wolverhampton Gas Company, and comprises one of Bratt, Colbran, & Co.'s "Portello" gas fires in a pleasing Napoleon wall panel—an indication of the suitability of these up-to-date gas fires for such treatment.

National Gas Council.

Meeting of the Central Executive Board.

A meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, Nov. 13, at 2.30 p.m.—Sir DAVID MILNE-WATSON, LL.D., D.L., in the chair.

Electricity (Supply) Bill, 1934 (Government Measure).—It was reported that this Bill had now been withdrawn by the Government, and that the Prime Minister had stated that it would be reintroduced next Session.

Stamping of Meters.—The case was reported of a gas company being prosecuted at the instigation of the Board of Trade on the ground that gas had been supplied by the Company through a meter which had not been stamped in accordance with the Gas Meter Regulations, 1920. The case against the Gas Company had, however, been dismissed by the Justices.

A Report of the proceedings of the Joint Co-ordinating Committee was discussed, which included the following matters:

(*a*) *British Gas Federation.*—It was reported that the Inaugural Dinner of the Federation which took place on Monday, Nov. 5, under the Presidency of Lord Macmillan, had been attended by six hundred and sixty-six representatives, including many distinguished guests.

(*b*) *Public Lighting Brochure on Street Lighting.*

(*c*) *Membership of the Illuminating Engineering Society and the Association of Public Lighting Engineers.*

Gas Unit.—A discussion took place with regard to the desirability of the adoption of a gas unit which would be likely to prove acceptable to gas undertakings throughout the country.

It was decided to consider the matter further at a later meeting of the Board.

Research and Technical Organization of the Institution of Gas Engineers.—The Chairman (Sir David Milne-Watson), Mr. A. W. Smith, and Mr. W. J. Sandeman were appointed to represent the Council upon the Advisory Committee on Research set up by the Institution of Gas Engineers.

Scottish District Executive Board.—The Chairman reported that he had been invited by the Scottish District Executive Board to visit Scotland and to meet their members for the purpose of discussing various matters which particularly affected Scottish interests. He stated that he had arranged to go to Glasgow on Tuesday, Nov. 27.

Scottish Junior Gas Association (Eastern District).

Visit to the Carron Company.

Between 40 and 50 members of the Scottish Junior Gas Association (Eastern District) visited the Carron Works, Falkirk, on Nov. 10.

The Carron Works have been manufacturing various cast-iron products for 175 years, and during the whole of this time there has always been at least one blast-furnace in operation. They have truly established a wonderful record and justified their motto, "Esto perpetua."

Many famous personages have been associated with the Company since 1759, including Dr. John Roebuck, an eminent scientist and mineralogist, and James Watt who had castings made here for his steam engines of the 18th century. The well-known "carronades" used in naval men-of-war in Nelson's time were produced at Carron.

The iron produced from the raw materials was seen being run into moulds from one of the blast furnaces, which produces 600 tons of pig-iron per week. These furnaces are lined with 3 ft. of firebrick, and work at a temperature of 2,000° C., their life being 5-10 years. They are water-cooled, and produce three casts per day. The pig-iron is then sent to the cupolas attached to the different foundries, and it was interesting to note that old motor cars form a large source of the scrap iron used. All types of casts are made—pipes, baths, fires, pans, surrounds, cookers, and all general engineering requirements up to 100 tons.

A plant for manufacturing enamel was seen, and this is applied both in powder and liquid form to cookers and fires, baths, &c., and stoved in gas-fired muffles. Both gas and electric appliances are made. One large range for a restaurant used electricity in the ovens, and gas for the hotplates.

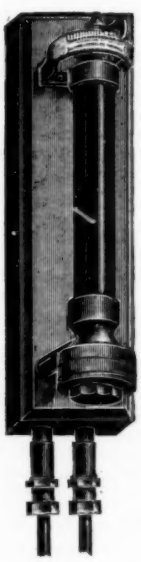
The visit terminated by the members and their guides assembling for tea at the invitation of the Company. Mr. Oliver, on behalf of the Company, extended a welcome to the Association, and expressed their pleasure at having the members visit their works. Mr. Sydney Smith (Dunfermline), the President, replied to the welcome and commented on the wonderful record of achievements to the credit of the Carron Company.

Gas Exhibition at Perth.

Our photograph shows the display of the Perth Gas Department at an Exhibition recently arranged by the Perth Town Council. As can be seen, in addition to a striking display of gas fires and cookers, a special feature was made of domestic lighting, and we understand that this effort attracted hundreds of visitors to the stand. A further section of the display was devoted to water heating, and demonstrations of both cooking and laundry work were given throughout the period of the Exhibition. . . . The excerpt taken from the "Perthshire Constitutional and Journal" on p. 567 of last week's issue referred to the above display and not, as we thought, to that of the Dundee Gas Department, who had a stand at their own local Trades Exhibition early last month. Mr. David Vass (Engineer and Manager of the Perth Gas Department) tells us that the business resulting from their display reached a total of about £800, and that the nature of the apparatus sold will lead to a considerable increase in gas consumption.

"Spersom" Thermostatic Gas Controls.

A valuable brochure has recently been issued by Messrs. Sperryn & Co., of Birmingham, describing and illustrating the firm's "Spersom" thermostatic gas controls and some of their uses.



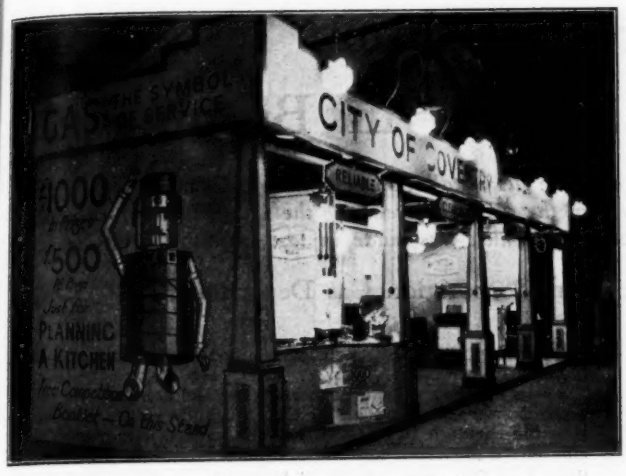
"Spersom" Room Thermostat with Graduated Scale.

These controls cover a wide range of applications, and include the ordinary type of oven thermostat for gas cookers, as well as those for water heaters, central heating units, clothes-drying cabinets, gas radiators, and other domestic and industrial apparatus. Photographic illustrations show the positioning of the control in examples of the above-mentioned and many further applications.

Details are also given of the "Spersom" remote control valve and room thermostat, which is shown in the accompanying illustration. Many cases arise on gas-heated apparatus, particularly in connection with central heating, where the thermostatic control is more conveniently carried out by means of remote control than by direct-acting thermostat. This is particularly the case where the consumption of the burners of the apparatus is high or where the space provided for the control would not be sufficient to take a large direct-acting thermostat through which the main supply would pass. The "Spersom" remote control valve is stated to have practically a snap action in operation and embodies special features of construction and design. The room thermostat illustrated is utilized in conjunction with this remote control valve for controlling central heating installations, and it has a graduated scale from 30° to 90° F.

This publication is definitely helpful in suggesting additional methods and uses of temperature control on gas apparatus, and to this end it is of assistance in maintaining and extending the use of gas.

GAS EXHIBITIONS FROM ALL PARTS

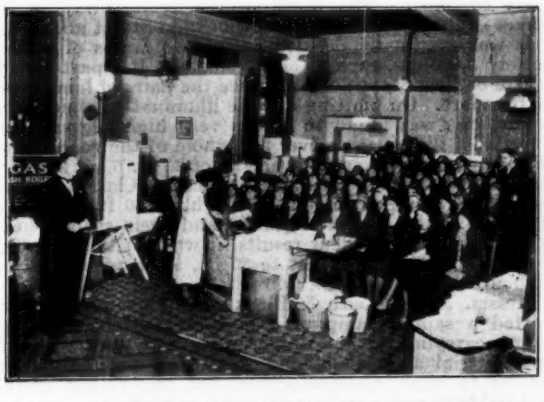


The two photographs, above and right, are of the Coventry Gas Department's display at a recent local "Better Homes" Exhibition—the one being a general view of the stand and the other a section set out to represent a modern kitchen. It will be noticed that a prominent feature was made of the B.C.G.A. Kitchen Planning Competition. Mr. P. N. Langford, the Gas Engineer and Manager, reports that excellent business has resulted from the Exhibition, the attendance being the best for the past seven years.

"Brighter Homes" at Sheffield.

On the left is a view of the Sheffield Gas Company's stand at the "Brighter Homes" Exhibition, organized by the "Sheffield Telegraph" in the Norfolk Drill Hall—a popular local attraction which is visited by many thousands of people. The Company's stand was four-sided, with an inner room fitted up with various types of gas water heating and cooking apparatus. Mr. Ralph Halkett, the General Manager and Secretary of the Sheffield Company, tells us that the sales of gas appliances and fittings as a result of this Exhibition have exceeded any similar venture in recent years.

Cookery demonstrations and a most successful cake-baking competition were features of a Gas Exhibition at Crawley arranged by the Horley District Gas Company. Nearly 1,400 housewives attended these demonstrations, which were in the hands of Miss D. J. Baker, of the Radiation Research Kitchen, throughout the five days of the Exhibition.



Cookery and washing demonstrations were organized a short while ago by the Liverpool Gas Company. So popular did these prove that accommodation could not be found for many would-be visitors. We are indebted to Mr. Standon Stubbs, Secretary and Treasurer of the Company, for the above photograph taken at one of the sessions.

Wonderful Example of Street Lighting in Birmingham

Corporation Street and New Street are the two principal thoroughfares in Birmingham, and it was decided that an intensity on the road surface equal to that required by Class "A" of the B.S.I. Street Lighting Specification should be afforded.

A description of the gas installation in what are claimed to be the best lighted streets in the world, reference to the Lord Mayor of Birmingham's inspection of which was made in last week's "JOURNAL."

By R. G. MARSH, of the Birmingham Corporation Gas Department

The traffic conditions in both Corporation Street and New Street, Birmingham, are extremely heavy during the day and the pedestrian traffic on the footpaths is also much congested. After due consideration the decision was reached that the best way to afford the illumination required would be by means of high-pressure gas lamps suspended over the carriageway on wire cables stretched across the street and attached to the buildings on either side. This would not only make unnecessary any additional columns in the roadway, but would also enable the City Engineer to dispense with a large number of existing lamp columns. The width of the carriageway in New Street is about 35 ft. and in Corporation Street about 40 ft.

BEFORE AND AFTER.

Corporation Street, Birmingham, at night as seen (left) under the old conditions of lighting and (right) with the new Class A Installation.

It was eventually decided to fix two lamps of approximately 3,000 c.p. each at a distance of 7 ft. apart over the centre of New Street, and to space the pairs of lamps about 70 ft. apart. On plotting out the illumination which would result, this was found to give a very high degree of uniformity of illumination over the whole of the road surface, the lamps being fixed at a height of 26 ft. 6 in. above the surface of the road. The specification for Class A Lighting calls for a minimum mounting height of 30 ft., but as the selection of the size of the units and their spacing-height ratio gave such excellent results, it was not thought necessary to increase the height to 30 ft., as this would involve difficulties in several other directions.

Messrs. James Keith & Blackman Company, Ltd., submitted a sample lamp of a new design incorporating a heater carrying six more high-pressure mantles. This was put on trial and tested, and was found to give excellent results as regards candle-power, but was rather unstable and liable to cause trouble by lighting back.

This obstacle was eventually overcome by fitting to the lamps a delayed-action automatic air regulator valve, which had the effect of causing pure gas only to be admitted to the burners during the first few seconds of lighting up, and also pure gas to be admitted during the last few seconds before extinguishing. This arrangement has been incorporated by the makers in the new lamps which have been supplied.

From fig. 1 it will be observed that the complete injector head is enclosed in an air box, and admission of air is only possible through the flap valve. The valve is made of non-corrodible material, and the complete valve and lever weigh only 1·25 oz. The weight is sufficient to cause the valve to remain closed during the few seconds before the pressure rises to the maximum at the injector nipple, so that only gas passes down the mixing tube. As the injector action increases the valve opens and admits air automatically, and remains open as long as the injector action is sufficient to maintain it. When the gas pressure decreases during extinguishing, the air valve shuts before the gas is finally turned off by the automatic lighter, so that the extinguishing of the lamps takes place quietly and without any damage to the mantles.

Owing to this alteration, it was found necessary to increase the pressure at which lamps of this type normally operate, and 9 in. of mercury was finally settled upon.

Means of Control.

The method of control was then carefully considered, and at first it was thought that it would be necessary for the lamps to be turned on and off by hand by the control taps in the roadway.

The Horstmann Gear Company, Ltd., were approached regarding the possibility of manufacturing control clocks suitable for working under a pressure of 15 lbs. per sq. in.—which is that obtaining in the high-pressure supply mains—and at first this was thought impracticable. It was suggested to them, however, that the difficulty of the plugs having to stand this high pressure might be overcome by cutting a small groove in the plug above and below the gasway, to collect the leakage which took place when the plug was in the "off" position, and allowing this gas, together with the gas through the adjustable by-pass, to pass

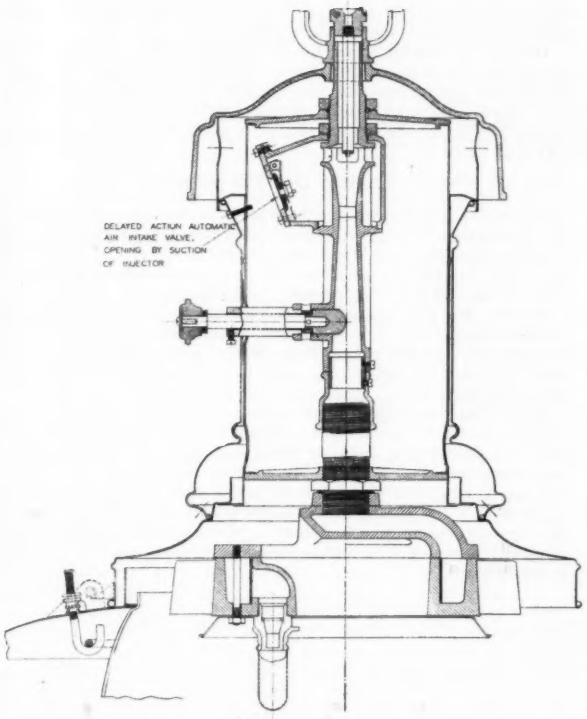


Fig. 1.—Section of New Pattern 6-Light Keith High-Pressure Lamp. Nominal 3,000 C.P.

to the distance lighter on the lamp and thence to the permanent pilot light.

As shown in fig. 3, this is an extremely simple method of overcoming the obstacle, and there appears to be no reason why plugs suitable to withstand any required pressure should not be made in this way. The arrangement was incorporated by the makers in the clock controllers for the installation, together with an extra train of wheels to slow down the movement of the gas cock so that the full benefit of the automatic air regulator valve above referred to could be obtained.

Suspension Cables and Fixing Hooks.

Tests were carried out on the various materials which would be used in the erection of the suspension cables. It was decided to use ¾-in. wire cable for the overhead suspension, and this particular size was guaranteed by the makers to have a breaking load of not less than 17·5 tons.

The hooks which were fixed in the walls to support the cable were all individually tested to a load 100% in excess of that which they would be called upon to carry, and a number of hooks were individually tested to destruction. The load at which the 1¼ in. diameter hand-forged hooks were found to open out was 5·21 tons.

Samples of the straining bolts used for pulling up the cables after erection to the required degree of sag were individually tested to destruction, and found to stand a maximum of 18·65 tons before breaking.

So far as was known, therefore, the hook was the weakest part of the whole installation, the only unknown factor being, of course, the strength of the wall into which the hooks were built.

The method of fixing the hook in the case of the ordinary brick or stone wall was simple. The 1¼-in. hook was passed through a hole drilled through the entire thickness of the wall and pulled up by means of a wall plate of ample dimensions secured on the inside surface and let in below the plaster.

It was felt that it was desirable to ascertain with a little more certainty what actual load walls of various materials and thicknesses might be expected to stand, as this was the only unknown factor. Arrangements were made to carry out a series of tests on an old building at one of our works. The wall selected at one time formed part of an old retort house and was scheduled for demolition. It was of brickwork 14 in. thick. The portion selected for fixing the hook was between two window openings, and as the wall was not supported by any partition walls, and, furthermore, there was no superincumbent weight of roof, it was judged that the wall selected for the test was at least weaker than any which would be used in actually carrying out the work.

A hook of exactly the same type and dimensions as that used in New Street was fixed in the wall, with a standard size wall plate at the back of it. This wall plate measured 2 ft. 8 in. by 8 in. by ½ in. thick. A load was applied to the hook by means of a steel rope, winch, and system of pulleys. Between the pulley block and the hook in the wall was fixed a shearing tool.

A number of test-pieces of different materials were prepared and their shear loads determined by experiments beforehand in the laboratory. Shear-pieces were then fixed in the apparatus and the load applied by means of the winch.

Shear-pieces carrying 0·4 ton, 1·2 tons, 1·4 tons, 2·8 tons, and 4·1 tons were sheared successively without any visible effect whatever on the brick wall. No sign of bulging or failure was detected, although most careful observation was made of it while these loads were being applied.

A test-piece capable of carrying 6·1 tons was used next in the shear apparatus, but this was not broken, as at something below this load the hook in the wall opened out and broke, confirming the previous observation in the laboratory.

The above test was repeated on a hook provided with

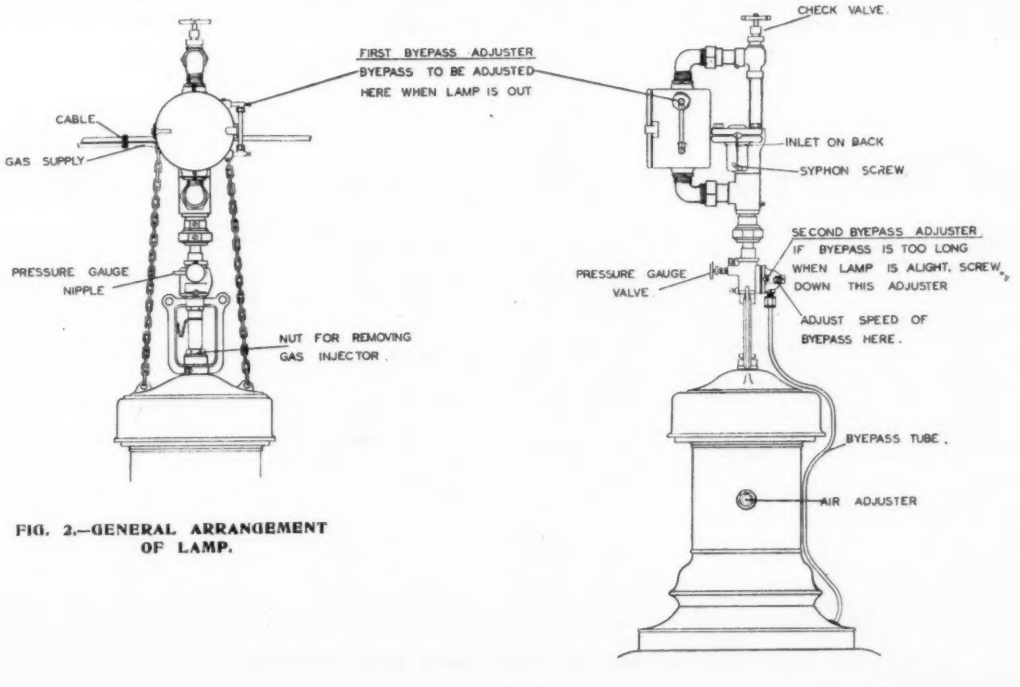


FIG. 2.—GENERAL ARRANGEMENT OF LAMP.

only a 6-in. square back plate on the inside of the wall, but the hook opened out exactly as before. Even with this small back plate there was no visible effect on the wall.

The loads were not carried beyond this figure, as the load at which the hook broke was known and there was no object in testing the wall further.

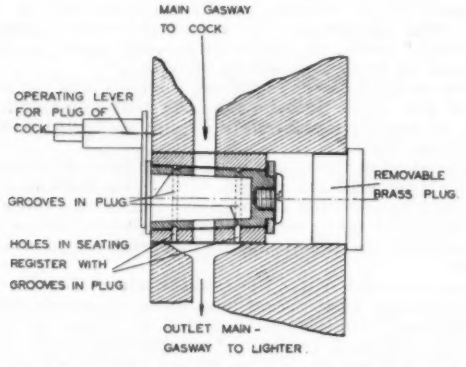

MAIN GASWAY TO COCK
OPERATING LEVER FOR PLUG OF COCK
REMOVABLE BRASS PLUG
GROOVES IN PLUG
HOLES IN SEATING REGISTER WITH GROOVES IN PLUG
OUTLET MAIN - GASWAY TO LIGHTER

Fig. 3.—Method of Collecting Leakage from Plug of Gas Cock in Clock Controller.

These tests were carried out because no definite information was held regarding the strength of walls of various thicknesses. Advice was given by builders and architects that the walls we should be using would be amply strong enough, but beyond this vague assertion no particulars were in our possession.

The actual load on the hooks which have been fixed in Corporation Street and New Street varies between 900 and 300 lbs., the variation being caused, of course, by the differences in the width of the street and sag allowances, and, therefore, the tests were considered to be exceedingly satisfactory, and to show that we had a factor of safety of not less than ten.

In connection with several steel frame buildings which were used for the fixing of hooks, quite different treatment to that employed with the ordinary brick or stone wall was necessary. The brick panel between the steel framing was not considered sufficiently strong for the purpose, and, therefore, in every case the fixing was obtained on the actual framing.

Obtaining Wayleaves.

Before any of the work of fixing the hooks could be commenced, the necessary wayleaves and permission had to be obtained from the various owners, sub-lessees, and tenants. This was a tedious business because so many interests had to be consulted; it was, however, carried out without any serious difficulty being encountered, and in the majority of cases the utmost willingness to assist in the scheme was met with.

The actual work of cutting the holes and fixing the hooks was carried out by stonemasons, who worked from scaffolding erected outside the buildings, and the interior decorations disturbed were made good.

When the hooks were fixed, careful measurements were taken of the actual distance between each pair, in order to obtain the necessary steel cable of the right length in one piece. The erection of the cables presented no difficulty, the work being carried out on Sundays when traffic was less heavy.

Laying the Services.

The work of laying the services to the pits provided at the pavement level, fixing the control cocks in the pits, and running the supplies from the pits up the front of the buildings and out to the positions on the cables where the lamps were to be fixed was next proceeded with.

Owing to the number of elaborate plate glass shop window fronts to be negotiated, this work presented a certain amount of difficulty, but when completed and the pipes painted out, the result was a neat, satisfactory, and entirely inconspicuous job.

Individual supplies were run to each lamp the whole length, right from the pit. It was necessary to carry out most of this work also on Sundays, but a certain amount was done on Wednesday afternoons.

Copper supplies were run in most cases, and copper was invariably used from the wall along the cable to the position of the lamp suspension fitting. The copper supplies being clipped close to the cable renders them almost invisible from below.

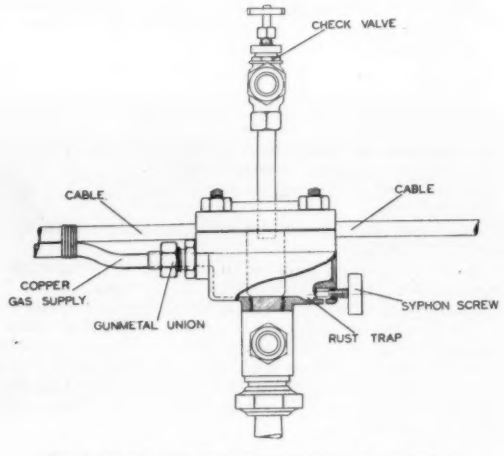


Fig. 4.—Detail of Cable Clamp and Gas Connections.

A special feature was made of the centre fitting on which the lamp is hung. The copper supply was connected to the fitting and a rust and condensation trap provided. This trap is capable of being cleared by opening a small thumb-screw blow-off cock. The arrangement is shown in fig. 2, and fig. 4, from which it will be observed that after leaving the

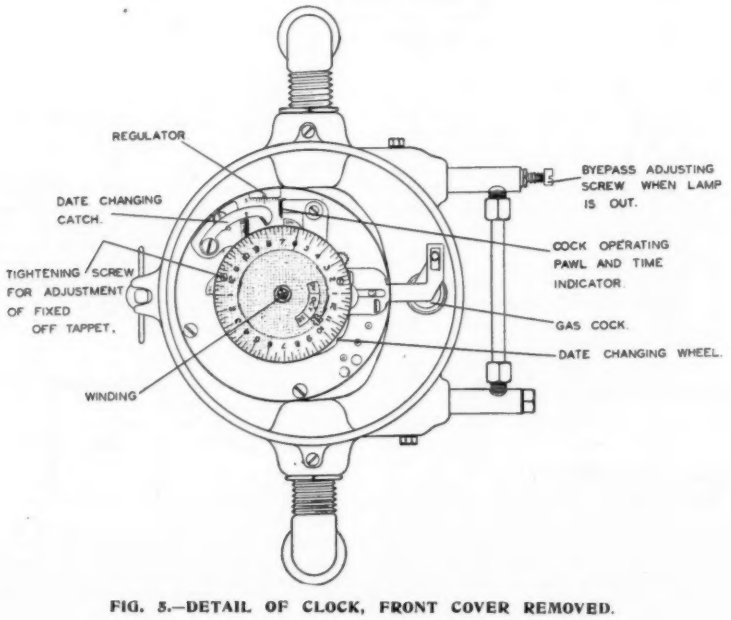


FIG. 5.—DETAIL OF CLOCK, FRONT COVER REMOVED.

rust trap the gas passes through a needle regulating valve to control the pressure, thence to the clock controller and so to the lamp. This makes possible the changing of a clock or lamp independently.

Owing to the position of the clock being to one side of the centre of the supporting cable, it was necessary slightly to offset the point of suspension of the lamp itself, so that the weight of the lamp would balance that of the clock and allow the whole to hang vertically.

The general arrangement outlined above applies throughout the whole length of the thoroughfares illuminated by central suspension lamps, with the exception of one portion in New Street where it was not found possible to erect the anchorage bolts at the positions where the spacing required the lamps to be fixed, and a special arrangement of overhead cables was therefore constructed at this point. A rectangular frame of cables with wrought-iron rings at each corner was constructed, from which the lamps were actually suspended, and the cables supporting this framework were attached to supporting hooks on the buildings at points not opposite to the position of the lamps. This section, which we have called the "cat's cradle," is the only variation from the general scheme.

A tramway line exists in the part of Corporation Street lighted by overhead lamps, and as this thoroughfare is wider than New Street, the spacing of the lamps on the cables was fixed at 12 ft. apart instead of 7 ft. as in New Street. This gives greater security to the maintenance attendants who have to keep clear of the overhead tramway wire when using the motor-driven tower ladder for attending to the lamps.

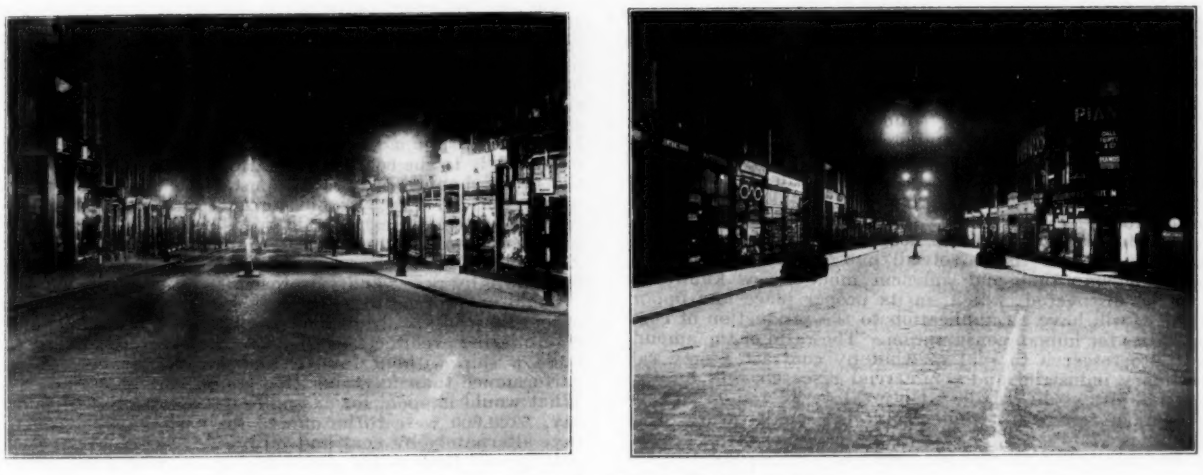
A further section of Corporation Street has so many tramway wires that the overhead system of lighting was found to be impracticable, and in this portion lamp standards 28 ft. 6 in. high will be provided, each column being fitted with two arms at an angle to each other of 90° and carrying one similar lamp on each arm. Services are laid to pits provided at the base of the columns and individual supplies run from the pits to the lamps as before, but in this case the control clocks are provided in the lower part of the lamp column itself and are accessible by means of a door in the base.

Control Clocks.

The clocks provided to control the lamps throughout the system are fitted with solar dials automatically to vary the time of turning on to conform with the schedule for the lighting of street lamps. Half the total number of lamps are arranged to extinguish at midnight, adjustable fixed extinguishing tappets being provided in the clocks. A further number of lamps are timed to extinguish at 1.30 a.m. and the remainder (about 25% of the total) are fitted with solar extinguishing tappets so that they remain alight until the schedule time for extinguishing in the morning.

Maintenance work on the lamps will be carried out during the night hours and will commence at midnight, a regular schedule of lamps to be attended to each night being worked to by the attendants, and any defects reported by the patrol before midnight will be attended to on the same evening. This work will be carried out from tower ladders fixed on a motor vehicle.

Provision will be made for lighting a number of the overhead suspension lamps should occasion require it (such as foggy conditions, &c.) by means of a magnetic release for the clock mechanism. This will be operated from a suitable plug-in position on the side walls of the buildings by the lamplighter. This special provision is not necessary in the case of the column lamps owing to the accessibility of the controlling clocks.



ANOTHER "BEFORE" AND "AFTER" PICTURE.

New Street, Birmingham, at night seen (left) under old lighting conditions, and (right) as it now appears.

Purification of Crude Benzole with Fullers' Earth

Experiments on the use of fullers' earth for the purification of benzole are described by H. Mainz and W. Mühlendyck in *Brennstoff-Chemie*, 1934, 15, 361-365 (Oct. 1).

In preliminary experiments, a 97% crude benzole boiling between 80° and 180° C. and smelling strongly of sulphuretted hydrogen was employed. Purification was effected by refluxing 250 c.c. of the benzole with 20 grammes of various types of fullers' earth preparations for two hours with the help of a mechanical stirrer. The refined product was recovered by distillation, dried, and redistilled. The content of gums was reduced to as little as 1 mgm. per 100 c.c. when Tonsil was employed and to 17 mgm. per 100 c.c. when Frankonit F was employed. Other earths gave intermediate results. The results obtained with Floridin were not so good, and this was found to be due to the fact that the Floridin was coarser in grain. When the Floridin was ground to the same state of fineness as the other earths, its behaviour was as good as that of Tonsil.

Since fullers' earth removes not only the gum-forming constituents but also free sulphuretted hydrogen and the greater part of the organic sulphur compounds, the purified products, giving less than 10 mgm. of gum per 100 c.c., must be regarded as high-grade benzoles with good storage and light stability.

Experiments, in which the amount of fullers' earth, the temperature of treatment and the time were varied, showed that the first factor has the greatest effect; 4% of Tonsil on the weight of the benzole suffices. The influence of temperature and time affects principally the storage stability of the benzole, since, with a short period of treatment at atmospheric temperature, the gum content soon rises beyond the permissible limit.

In experiments in which 1·1 gallons of benzole were treated for two hours, with direct heating, with quantities of Tonsil ranging between 9 and 4·5% of the weight of the benzole, the yield of product recovered by distillation ranged between 92 and 95%. The remaining 5-8% was left behind with the earth and consisted of organic sulphur compounds, highly unsaturated compounds, naphthalene, and gums. The first three of these could be recovered by steam

distillation, leaving a final residue of 1·5 to 3%. The main distillate, after it had been dried, showed a content of 3-8 mgm. of gums per 100 c.c. and thus complied with the requirements of the Benzol-Verband. The sulphur content was also within the permitted range. The steam distillate showed a gum content of 200-500 mgm. per 100 c.c. and a sulphur content more than twice that of the refined benzole. The individual fractions of benzole behave differently according to the nature of the crude benzole and the distribution of the gum-forming material in the fractions.

It seems that storage stability depends on the purity of the product and on the nature and transparency of the container. However, gum formation due to light action does not occur in a well purified product.

The adsorptive capacity of fullers' earth decreases with increasing content of brown polymerization products in the crude benzole. Hence benzoles rich in these products should be submitted to a preliminary steam distillation. The steam has a further beneficial effect in causing the polymerization of some of the unstable constituents of the benzole. On the other hand, with certain benzoles, treatment in the cold is sufficient to give a very satisfactory product.

Later experiments were carried out in a steam-heated iron vessel 12 in. in diameter and 12 in. high with an agitator running at a speed of 350 r.p.m. The steam, in superheated condition, was supplied indirectly by way of a coil passing through the lid of the vessel. Two condensers were provided, one inclined slightly upwards to serve as a reflux condenser during the treatment, the other inclined downwards for use in the subsequent distillation. In order to increase the storage stability of the product, only 95% of the benzole was collected. A further 2-3% can be recovered by steam distillation and is useful as raw material for hydrogenation.

It is claimed that refining by means of fullers' earth is no more expensive than the usual acid wash process, that maintenance costs are lower and that operating conditions are simpler. The earth is readily regenerated by exposure to air and can be used twice.

Value of Research to the Fuel Industries

By
Sir Harry McGowan,
K.B.E., LL.D.

From the President's Address to the Institute of Fuel.

Experience has shown me the vital connection between research of all varieties, on the one hand, and commercial and financial prosperity on the other hand. Research in the fuel industries is no simple subject, but rather one which, if considered from the point of view of cost, may be thought to open up such a vista of illimitable expenditure that there may well be hesitation before fresh work is undertaken. In no direction is this fear more to be respected than in regard to what is called " pure " research. Alternative expressions for this branch of work are " academic " research, or " fundamental " research. By that I mean work which cannot be linked directly, or even indirectly, to any existing industrial process or commercial commodity. Research of this kind is, quite simply, a search for new knowledge, whatever that knowledge may prove to be. It sets out to explore the unknown, to extend the boundaries of what has been gained in the past, fully conscious of the risk involved, but equally certain that, given enough time and sufficient money, new knowledge will be discovered, which, in its proper place and opportunity, will have an application to the production of commodities for human consumption. The ratio of the amount of pure research to that of what by contrast I may call ordinary industrial and commercial research, will for this reason always be small. Uncertainty is too great and monetary resources are normally too small for it to be otherwise.

Ordinary coke, as you all know, is a bye-product in the manufacture of gas, and there is another kind of coke which is used for the production of pig-iron. On the research side for coke, we have various excellent sub-committees who are doing all they can, having regard to the very small resources at their disposal. I would suggest that it is worth considering whether the amount of money spent on research on coke is proportionate to the tremendous turnover in the industry.

In the Gas Industry this country was a pioneer. The movement was founded largely on local units and small gas undertakings still represent the bulk of the Industry. Their facilities for research are naturally small. On the other hand, we have a few great gas corporations which have prosecuted research on a wide front with energy and success. To-day leaders of the Industry are turning their attention to the financial consolidation of numbers of smaller companies, and additional research activities may be expected to flow from this development. It is difficult to hold the scales fairly between gas and electricity; but taking the long view I see no reason why they should not progress side by side as friendly rivals in a field of enterprise which will lead to an enormous net increase in the use of coal. Electricity has woven a huge web over the whole country, in the form of the grid, and is attracting industrial consumers for purposes for which this form of power is either essential or clearly advantageous. At the same time, there are other industrial operations which can be far more economically undertaken by gas. Gas is storable—electricity has not that great advantage. Great Britain has one reasonably sized gas grid in the Midlands, but nothing to compare with the big German high-pressure grids. A national gas grid might fulfil many useful functions without injuring the interests of electricity. The difficulties are legal and financial rather than technical, so that with some goodwill but much legislation we might see a considerable expansion in the use of gas.

The fuel industries present an uneven front of research. It is easy to reproach an industry for not embarking upon research, for proper avenues of such work are not always immediately determinable. Had not chemistry and physics been of such obvious interest to my own industry and the electrical engineering industries, it is probable that we should have accomplished far less. It is in this spirit that I venture to put a suggestion to the fuel industries, and particularly to the coal industry. Criticism is easy, so that the critic should always ask himself the question: What would you do? Well, could we not take into special account the temperament of our fellow-countrymen which has been so well exemplified by the recent great air race to Australia? That suggests two things might be done: (1) Procedure by prize, and (2) procedure by levy.

Could we proceed to help the fuel industries and perhaps others by prizes? To-day in Great Britain there are first-class marine architects who maintain that it is possible to build a ship without funnels and with a far better fuel performance than anything that at present sails the seas. What would happen, for example, if a substantial prize of, say, £100,000 were to be offered for a ship to be driven, say, alternately by coal and oil?

When we turn to the possibility of research financed by levy, it is appropriate to remember that the coal industry is already well acquainted with the levy principle, for the Miners' Welfare Fund is financed by that device. It is difficult to over-assess the good which might eventually accrue to the fuel industries by a research organization conducted on really generous lines through the mechanism of a financial levy. Let us assume that somehow or other it would be possible to raise an overall sum of ¼d. per ton. This should not be beyond the wit of the coal industry. (You will notice I am carefully refraining from any concrete suggestion as to who should pay it.) This would bring in about a quarter of a million pounds a year, which would be a fairly reasonable sum. This could be entrusted to a " Fuel Development Committee," governed by an Administrative Council composed not only of representatives of industry, but also of scientists of distinction. A body of this character would proceed by the method of sub-committees.

The amount of money available would enable full scale trials to be made of improvements suggested by technical research on existing processes. This could either be done by erecting special full scale plants, or by subsidizing some new industrial plant against the risks which might be incurred in making the experiment. To-day new processes are often tried out by the flotation of new companies to develop patents, before adequate work to test them has been done. Recent years have shown how wasteful of the investors' savings that method can be. Experimental tests on a full scale should be applied to any promising process coming in from outside, and the reports of such a Committee on their results would form a guarantee on which the investor could rely in placing his capital.

Modern Legislation for the Gas Industry

By George Evetts, M.Inst.C.E.; M.Cons.E.

No. 5

THE Author continues his review summarizing the position of legislation up to the present time as it affects the Gas Industry to-day. Previous articles in this series appeared on Oct. 24 and 31, and Nov. 7 and 14.

Domestic and Administrative.—Contd.

Form of Accounts.

It has been a principle of gas legislation that the Accounts of the Undertaking shall be open to public inspection in a form sufficiently detailed to show the separate main heads of expenditure and receipt of money. In the Act of 1847 Section 38 enacted that in each year the Account in abstract was to be prepared of the total receipts and expenditure under several headings, with a statement of the balance duly audited and certified by the Chairman of the Undertaking and by the Auditors, and a copy transmitted to the Clerk of the Peace for the County in which the gas-works was situated. This copy was to be open for inspection by all persons at all " seasonable " hours on payment of 1s. for each inspection. This Section was superseded by Section 35 of the Act of 1871. By this Section undertakers were compelled to fill up and forward to the Local Authority of every district concerned, on or before the 25th day of March, an Annual Statement of Accounts made up to the next preceding 31st day of December. These Accounts had to be made up in a form set out in Schedule " B " to the Act, and the undertakers had to keep copies of the Statement at their office, and sell them to any applicant at not more than 1s. per copy. The Board of Trade were given power, but only with the consent of the undertakers, to alter the set forms, either to adapt them to the special circumstances of the Undertaking, or to carry into effect better the purposes of the Section. The form set out was in general use for many years, and to this day forms a basis of the Accounts of many Gas Undertakings.

The position at the present time is governed by Section 15 of the Act of 1920, which compels all gas undertakers (that is to say, statutory undertakers) to furnish to the Board of Trade, at such times and in such form and manner as the Board may direct, an Annual Account, together with such statistics and returns as the Board of Trade may require. Within seven days of the date on which the Account is sent to the Board of Trade, the undertakers must send a copy to the Local Authority, and place copies on sale at their own Offices at not more than 1s. per copy. This Section supersedes the Sections previously mentioned in the Acts of 1847 and 1871. Although this is the case, the Board of Trade have never issued a definite form of Accounts in substitution for the form scheduled in the Act of 1871, and such modifications as are incorporated in the Accounts of Undertakings are mostly inserted for the convenience of the undertaker concerned. In the Act of 1934, non-statutory undertakers are required by Section 11 to make a return of the quantity of gas supplied, in such form as the Board may direct, and within seven days they must send two copies to every Local Authority within their area, and one of these copies must be kept open for public inspection at all reasonable times. It will be seen therefore that the Board of Trade still have no power to call for Accounts from non-statutory undertakers.

It may perhaps be interesting to note the usual additions to the old form of Accounts, which are usually now included. The capital account is not substantially altered, in so far as statements of share and loan capital are concerned. The Capital Account itself will usually contain, in adddition to the receipts normally obtained from share and loan capital, either premiums or discounts, and very likely a nominal sum representing " watered " capital, which arises owing to the fact that stock carrying a high dividend is frequently converted into a larger quantity of stock carrying a lower dividend, although no actual cash has been received by the Undertaking in respect of this increased nominal capital.

On the expenditure side of the Account it is usual, after setting out the previous total and charging the expenditure under the various items during the current year, to deduct a sum for depreciation or obsolescence, before arriving at the net expenditure to date. It is curious to note that the prescribed forms apply only to Company undertakers, and there does not appear to be any prescribed form for Local Authorities.

Revenue Accounts remain very much as they have been for 60 years, except that receipts from benzole find a place, and the receipts for gas are frequently split into " prepayment " meter receipts and " ordinary " meter receipts. On the expenditure side sums are often allocated to Pensions and Co-Partnership, and the Special Purposes and Renewal Funds are substituted for the older Reserved or Insurance Funds.

A Statement of gas made, sold, and used on works is now usually included, although at one time it was by no means common, and coke is now stated in tons instead of chaldrons. These, however, are all minor alterations, and it has from time to time been anticipated that the Board of Trade would prescribe a standard form of Accounts to be followed by all Company undertakers, with perhaps an alternative form for Local Authority undertakers. There is no doubt that if all Undertakings complied strictly with a standard form, comparisons would be much easier as between different Undertakings, and the work of those involved in standard and basic price legislation, and rating and income-tax assessments, would be made considerably lighter. Usually, in basic price Acts or Orders, a provision is inserted that the undertakers must send to the Board of Trade, together with other accounts and returns, a statement showing the number of therms sold at each of the several net prices during the year, including gas for public lighting. It is usually added that they shall also furnish to the Board all such further information relevant to these matters as the Board may require.

It is further enacted that the Accounts of the Company shall contain such particulars as will enable the calculation to be made of the amount which may be paid as dividend or transferred to Reserve Fund.

Differential Prices.

Parliament and the Board of Trade have recognized that a sparsely populated area is more expensive to supply than a densely populated one, with the result that many Undertakings, both Company and Municipal, have their areas divided into what may broadly be described as inner and outer areas. The outer area carries an increased price, the difference between the price in the inner and outer area being usually referred to as the differential. There may be several outer areas subject to different excess prices.

Before granting such differentials, however, Parliament or the Board of Trade have to be satisfied that the increased charge is justified owing to the extra cost of production and supply of the outer as compared with the inner area. This difference may be due to extra capital per unit of sale, extra maintenance, extra collection and administration, boosting, &c. When a district gasholder is counted as part of the supply of the outside area, due credit must be given for the corresponding reduction in the necessary gasholder space at the principal works. The object of a district gasholder is, of course, to enable the mains to carry the gas to the outside districts at off-peak periods, and in these circumstances it would be reasonable to credit the works capital and the works gasholder maintenance with the deduction when applied to the gas necessary for the outside area. If the outside area is supplied from separate works, then the unit becomes more self-contained. The capital spent on the two works can be segregated, and the cost of production would also enter into the calculation, but in general the cost of trunk mains and boosting would

be avoided. In the case of amalgamations, it frequently happens that the smaller Undertaking becomes virtually the outside area, and it is not unusual to find the differential bearing some relation to the difference in price operating before the amalgamation. This is not unreasonable, because it may be assumed that each Undertaking is selling gas at the economic price, and consequently the difference in price represents the difference in cost of production and supply when in separate hands. It is frequently found that on amalgamation this difference is reduced because the larger Undertaking finds it can introduce immediate economies. It is not reasonable to give the outside areas the advantage of the organization of the principal area free of charge. Therefore, once having fixed a reasonable differential (whether as a result of operating in a new outside area or by amalgamation) the future decrease in prices is effected in two ways:

1. A general decrease in price caused by economies in the whole Undertaking. This may be due to a reduction in overhead charges, due to increased load in one area or the other, but both areas should share alike in this class of reduction.
2. A reduction in the difference in cost of supply between the two areas. This might be due to the capital in the outer area producing a bigger return per unit of sale, reduced maintenance charges, or reduced operating charges due to the increase in the density of the population. It must not be overlooked, however, that a decrease in cost in the outer area is not sufficient in itself for a reduction in the differential. The cost should be decreased by a larger amount than the corresponding costs in the inner area have decreased before the differential charge should be reduced on this ground.

When the question of differential arises, it involves the perennial argument between the Local Authorities of the inside and outside areas respectively. The representatives of the inside area usually say the differential is not enough and ask that it be compulsory. The representatives of the outside area in turn claim that the proposed charge is too much, and that it should be reduced over a period of years either by compulsion, or that the figure at any rate should be optional. The Undertaking promoting the Order can usually take the middle course between these claims by asking for the economic differential, and to have this optional, so that, if the circumstances of the future justify a reduction, then such reduction can be made. It is highly desirable that an Undertaking should sell in the outside area at the economic price unless there is some important political reason involved. It might be argued that in certain special circumstances it is the correct policy to encourage business by selling in both areas at the same price, but it is difficult to agree this as a general principle, seeing that it involves a definite subsidy of one group of consumers at the expense of another.

Viewed from the economic angle, a potential gas consumer moves into a country area for many reasons, and he may expect to get certain amenities and certain commodities at a cheaper rate, such, for instance, as more healthy surroundings, lower rates, and certain foodstuffs at a cheaper price. In turn, there are other things which are dearer, such as gas and electricity and town amusements, if these should be so desired. The customer sizes up the whole position before he makes the change, and there is no reason why he should expect to obtain gas at the same price in the country as he would in the town.

[A later section will deal with the effect of differentials on dividends.]

Purity, Calorific Value, Testing, Measurement, &c.

The 1871 Act compelled undertakers (meaning those with Acts or Orders) to maintain a minimum illuminating power for the gas supplied, and prohibited the presence of sulphuretted hydrogen. The latter provision still operates for all Undertakings whether statutory or non-statutory, except those selling less than 20 million c.ft. per annum. The conditions under which the small Undertakings come under this obligation were referred to in an earlier section of these articles.

Regulations as to Testing.

The conditions regarding the testing of gas for purity and pressure are prescribed in the 1920 Act, and amended in certain respects in the 1934 Act.

The illuminating power no longer has any significance for the "thermal unit" or non-statutory undertakers. Under the Act of 1920, thermal unit undertakers are free to declare any calorific value they think fit and, having done so, they must submit to test and pay penalties for default.

As previously mentioned, the whole machinery of testing for purity, pressure, and calorific value was in the hands of the Chief Gas Examiner and the Gas Referees under the 1920 Act, but under the 1934 Act, the duties are transferred to the Board of Trade. By Section 12 of the 1934 Act, the office of Chief Gas Examiner shall be abolished on the 1st January, 1935, and on the 1st January, 1939, the office of Gas Referees shall be abolished. Afterwards the Gas Referees' duties shall be performed by the Board of Trade, and the Board may appoint three competent persons to advise on gas testing, and such persons are to be paid for services rendered. In practice, therefore, there does not appear to be much practical difference in the procedure. The machinery created for the appointment of Gas Examiners in the 1920 Act is amended by Section 13 of the 1934 Act.

An important change is the amendment of the 1920 Act enacted by Section 14 of the Act of 1934. Under the former the excess revenue taken from the consumer on account of deficient calorific value had to be returned sooner or later by way of a price reduction, with the result that in certain cases small sums were put in suspense for long periods until it could be proved that it had been merged in a general price reduction.

Under the new Section referred to, if the excess revenue (*i.e.*, the illicit profit due to "under strength") is less than one-fifth of a penny per therm, the Gas Fund is to benefit by the amount in the year following that in which the penalty is incurred, unless the consumer has been re-imbursed by the supply of such a high calorific value in the preceding quarter as to bring the average above the declared value. This appears to be the interpretation of Section 14 (*a*). The term "first mentioned quarter" in paragraph (*a*) presumably refers to the quarter mentioned in the opening words of the Section—*i.e.*, "the quarter in which the deficiency occurs," and therefore this deficiency can be balanced by an excess in the "last preceding quarter." If the excess revenue is not so balanced, and is equal to one-fifth of a penny per therm or more, then the consumer is to be credited in the first quarter following the deficiency. In general multiples of one-fifth of a penny per therm are to be credited in this way, and the balances (if any) paid to the Gas Fund.

The legislation dealing with prescriptions, testing stations, method of testing, instruments, method of calculating average calorific value, and appeals, was fully covered by Sections 5, 6, 8, and 9, of the Act of 1920. Certain amendments to these Sections came into operation on the passing of the 1934 Act—for example, the new regulations in regard to average calorific value, which provide (Section 14, Sub-section 2*b*) that there must be a minimum of six tests before an Undertaking can be fined for deficient calorific value.

Other immediate amendments are prescribed in Part I. of the Second Schedule to the Act.

Other amendments coming into operation on Jan. 1, 1935, are prescribed in Part II. of the same schedule, and Part III. deals with further amendments coming into force on Jan. 1, 1939, when the office of Gas Referees is abolished.

Meters and Measurement.

With regard to gas measurement, the legal position relating to the stamping of meters and their certification as legal measuring instruments is complicated, due to the somewhat involved relationship between the Sale of Gas Acts, 1859 and 1860, the Weights and Measures Act, 1904, the Gas Regulation Act, 1920, and the regulations made by the Board of Trade arising out of that Act. Up to the passing of the Act of 1920, there was no doubt that the matter was governed by the Sale of Gas Acts, 1859 and 1860. The 1859 Act prescribed that, within ten years of the passing of the Act, meters were to be stamped in accordance with the provisions laid down therein, and the Act further prescribed the appointment of Inspectors, the division of the country into Administrative Areas for this purpose, and the provision of model gasholders for testing and so on. The 1860 Act, however, put the date forward by one year, and made the important proviso that the 1859 Act was not to come into operation in any county of England until the magistrates had resolved to bring such county under the operation of the Act. In Scotland the Commissioners of Supply had to take this decision, and in Ireland the Grand Jury of a County. Therefore, before 1920 an unstamped meter would be a legal or an illegal instrument, depending on the part of the country in which it was ultimately placed. In fact, of course, many Gas Undertakings bought stamped meters whether they were compelled to or not. Further, these two Acts applied specifically to the meter and not to the undertaker, and therefore extended to all meters, whether used by statutory or non-statutory Undertakings. If a non-statutory Undertaking operated in a

county which had resolved to make use of the Act, then the meters of that Undertaking had to be stamped, and if the consumer provided his own meter, the same applied.

There was a Section in the 1859 Act to the effect that, if a meter had been stamped and issued for one premises, it was not necessary to re-stamp it in the event of its being re-issued for other premises. This Act also provided that all meters purchased twelve months after the passing of the Act had to be stamped, and consequently, after the expiration of 50 years, it was fair to say that practically all the meters in a county adopting the Act would be legal measuring instruments.

It is reasonable to say that in 1920 this position was not satisfactory from the point of view of the Board of Trade, because there must have been many thousands of consumers purchasing gas with unstamped meters, due to counties not adopting the 1859 Act.

The Gas Regulation Act of 1920 dealt with the point in Sections 11-14. In general, these Clauses provide for certain modifications of the 1859 Act. For instance, the Board of Trade had power to raise the fees for the examination, testing, and stamping, and the provisions of Sections 5 and 6 of the Weights and Measures Act in relation to Regulations with respect to measuring instruments were extended to instruments for the measuring of gas. In other words, an Act passed subsequent to the Sale of Gas Act was used as a piece of machinery for operating the sale of gas under the 1920 Act. Arising out of this Section, it is important to note that the Board of Trade did issue regulations on Dec. 16, 1920 (Statutory Rules and Orders 2,354), and Section 13 of the 1920 Act rectifies the omission of certain counties to operate the 1859 Act. It prescribes that " all meters by means of which gas is supplied by any undertakers to any consumer shall be stamped in accordance with regulations," &c. It will be noted that this only applies to undertakers, and therefore non-statutory undertakers still come under the 1859 Act, and then only in such counties as have adopted that Act. If undertakers supply gas by means of a meter not so stamped, the fine on conviction is not to exceed £10, the fine under the 1859 Act having been £5. It should be further noted that this regulation applies to any meter through which gas is supplied; consequently an undertaker must insist upon meters owned by consumers (other than check meters) being stamped in accordance with the regulations. These various provisions, taken in conjunction, result in the unsatisfactory position of an Act of Parliament being overridden by regulations made under a subsequent Act, but this difficulty appears to have been provided for by Section 19 of the 1920 Act, the marginal note of which is " supersession of existing enactments." This Section states " . . . Any provisions of this Act . . . shall have effect in lieu of any provisions to the same effect or inconsistent therewith . . . in an Act relating to the testing of gas measuring instruments. . . ." An interesting legal point arises here. Can it be argued that regulations made under the powers of an Act are " provisions of this Act?"

The case heard at Ashton-under-Lyne Police Court on Oct. 22 this year points to the difficulties of interpretation. The case was referred to in a leading article of the " JOURNAL " of Oct. 31, p. 319. A meter was found not stamped in accordance with the 1920 Act. It was admitted that it was stamped in accordance with the 1859 Act, and the Gas Company relied on Section 10 of that Act, to which reference has been made, viz., that no meter duly stamped shall be liable for re-stamping unless found to be inaccurate. The Board of Trade relied on the power of the 1920 Act to make regulations and to insist that all meters should be stamped in accordance with these regulations, and that, if they were not so stamped, then they were not legal measuring instruments in accordance with Section 13 of the 1920 Act. The Bench held that Section 10 of the Sale of Gas Act, 1859, had not been repealed by the Act of 1920, and therefore, provided the meter was not inaccurate, there was no obligation to have it re-stamped under the 1920 Act above referred to.

This relates to the legal point. From the point of view of equity or common sense, however, the position is somewhat different. As before mentioned, on the passing of the Gas Regulation Act there must have been thousands of unstamped meters and millions of meters stamped in accordance with the 1859 Act. On Dec. 16, 1920, the Board of Trade issued the regulations in regard to the stamping of meters, and these regulations came into force on the 1st day of March, 1921. Therefore, within 2½ months of the issuing of such orders, the whole of the administrative and practical machinery had to be ready, and Undertakings ready to begin submitting their meters for verification and stamping to the total of upwards of 7 millions. It appears that, had the Gas Undertakings literally fallen in with these regulations, the Government Department concerned would have been snowed under and this part of the Act automatically rendered a dead letter for a long time. In fact, it appears the Board of Trade appreciated the difficulties, and up to the time when this case was heard it does not appear that any action had been taken. The Board of Trade presumably relied on the fact that, as new meters were purchased, they would be stamped automatically, and before many years were past every new meter would be stamped in accordance with the regulations. However, if the Magistrate's decision at Ashton is correct, the Board of Trade have no right to insist on the re-stamping of meters already stamped under the 1859 Act.

Section 14 of the 1920 Act deals with the qualifications of Inspectors and amends the 1859 Act in certain respects.

There are two further points arising out of the registration of meters:

(*a*) When is a meter accurate or inaccurate as the case may be?

(*b*) What is the period of error in the event of inaccuracy being proved?

With regard to (*a*), the figures of variation in Section 12 of the 1859 Act still holds good, *i.e.*, if a meter is not more than 2% in error in favour of the seller, and not more than 3% in favour of the consumer, it is deemed to be correct.

With regard to (*b*), most Undertakings had the Model Bill Clause which prescribed that, in the event of inaccuracy being proved, the erroneous registration was deemed to have arisen during the then last preceding quarter unless it was proved to have first arisen during the then current quarter. The 1934 Act, however, amends the wording to cover intermediate readings, naturally substituting a " period " between readings for the " quarterly " in the Model Bill. This meets the case of Undertakings with monthly meter readings. Provision is also made to cover the rebate or surcharge in case of error.

This Section (23) is not well drafted in one respect. It is not clear whether an erroneous registration of 2½% in favour of the seller has to be rectified to the extent of ½% or to the extent of 2½%. The words used are: " found to register erroneously to a degree *exceeding* the degree permissible." Later on it is stated that the meter shall be deemed to have registered erroneously to the " degree so found." The writer assumes that the total departure from absolute accuracy is deemed to be the error in registration.

It frequently happens, however, that the practical difficulties of distribution are of more importance than the limits of a permissible error. In a distribution system where the pressure at meter inlet may vary from 2 to 12 in. water gauge, there is a possibility of 2½% difference in the thermal units delivered to two different consumers, even though the meters may register the same. Similarly a variation of temperature of 20° F. will introduce a variation of 4% in the therms delivered, due to seasonal fluctuations, and as much as 5° involving 1% could easily occur on the same day between two consumers. Change of barometric conditions may account for a further variation of 2% or more. Taking the Undertaking as a whole, of course, these variations are not important, because they are all compensated for in the price of gas—*i.e.*, a price of 10d. per therm under these varying conditions may be equal to a theoretical price of 9·75d. when calculated at normal conditions. At the same time, there is the effect on unaccounted-for gas, and the variation will influence the apparent leakage. As between one consumer and another, however, the variations due to the conditions above named are at least equal to the maximum variation of 5% in the registration of the meter (*i.e.*, 3% one way, and 2% the other).

The Sale of Gas Act, 1859, with amendments applied in general to England, Scotland, and Ireland, and it is understood that these enactments have been embodied in the Irish Free State legislation. There is also the Sale of Gas Act (Scotland), 1864, which enabled certain Royal and Parliamentary Boroughs in Scotland to avail themselves of the 1859 Act.

[*Mr. Evetts will continue this Series with an article on Public Lamps, Hiring of Appliances, &c.*]

[In response to various inquiries, we are pleased to announce that, at the conclusion of the Series, we shall be able to publish Mr. Evetts' articles in book form at a price of 3s. 6d.]

Gas Companies' Protection Association

Mr. R. W. Edwards, Chairman of the Committee, presiding, reviews another successful year's work.

Thirty-Seventh Annual General Meeting, held at the Caxton Hall, Westminster, S.W. 1, Monday, Nov. 12, 1934.

The ACTING SECRETARY (Mr. R. Girdlestone Cooper) read the notice convening the Meeting, together with the minutes of the previous General Meeting, which were duly confirmed and signed.

The Chairman's Address.

In moving the adoption of the Report of the Committee the CHAIRMAN (Mr. R. W. Edwards) said:

The financial side of our Association continues to be sound and the balance-sheet for the year ended Sept. 30, 1934, discloses a very satisfactory state of affairs. Copies of the report and accounts have been circulated to all members, and I wish to draw your attention to the fact that this is the thirteenth year in succession in which we have had an excess of receipts over payments.

Our holding of War Stock, as existing at the date of the report, shows a capital appreciation of £211 9s. 4d. over the cost price standing in the balance-sheet. Since the date of the report a further amount of £300 nominal of War Stock has been purchased at a cost of £318.

The receipts from subscriptions and donations, while not quite so large as last year, continue to be good and highly satisfactory. As was to be expected, there is less return on our holding of War Stock due to conversion but this reduction is very nearly offset by the increase in our holding, as we had purchased a further £500 in November last.

Our Association's assets are worth at the present time £3,138 9s. 7d. and while we do not desire to hoard up money this sum is a useful fund for any emergency that may arise.

National Position of Trade.

At our last Annual General Meeting, I drew attention to the signs then in existence of a gradual improvement in trade, and I am happy to state that the year now under review has proved my prediction not to be ill-founded.

Trade and commerce, in which our country has always held so proud a position and played so illustrious a part, have once again begun to flow with sufficient freedom to enable many thousands more workers to be employed in industry than was the case twelve months ago.

Throughout industry generally there has been a quiet confidence so encouraging to the investing public, that has carried many industries on from strength to strength. It is the very earnest wish, I am sure, of us all that this should continue, and I see no reason why it should not do so.

We are, under the administration of the National Government, in a position that enables manufacturers and merchants to look ahead with some confidence—the element that is so essential—and to plan developments knowing that they will be able to proceed with some certainty because of that stability of policy of the central Government—a stability that seems to be entirely absent in most other countries.

This same attitude has been manifest in the stocks of the principal industries; to select any particular industry would be invidious. The cotton, woollen, and general textile industries continue to improve and hold their own in the world's markets. The heavy industries comprising coal, shipbuilding, engineering, and steel are in a much better position than they were a year ago, while agriculture and the building industry are steadily improving, so much so that optimism is very apparent.

There is a tendency, however, to inflict too many restrictions generally on industry and in particular that of agriculture, which is suffering at the present time from an acute form of legislative indigestion.

Trade returns have been steadily improving without anything spectacular. Industry generally has entered on an era of "cheap money" such as has not been experienced for decades. Contrast the position of a few years ago with that obtaining now when one municipal corporation has just placed three-year bonds at 2¾%.

The position abroad is not quite so good. Our American cousins experienced for some time a serious set-back to their National Recovery Administrations schemes, and it is impossible at the moment to state with any degree of certainty the outcome. I personally have yet to be convinced that general prosperity can be achieved by the outpouring of public money on temporary schemes, by legislation, or by the creation of dictators.

Europe is very unsettled, almost every component country is seething with discontent and strife, and news arrives with almost painful regularity of some untoward happening, the most recent in our minds being that most distressing affair at Marseilles. I feel sure I am voicing the general opinion of us all in expressing our sympathy and horror at so shocking an affair. The position of business men in those countries must indeed be trying, and we should be doubly proud of our country and nation at this time. Our efforts should, therefore, continue towards the preservation of those systems and institutions of which we are justly proud.

The Gas Industry.

The improvement in our national affairs has had a beneficial effect on our own Industry. Speaking generally, gas sales are on the up grade; apparatus connected is rapidly increasing, and, although sales do not advance in direct proportion to the amount of new apparatus supplied, we know that modern cookers and fittings are much more economical and give that degree of service enabling us to meet competition from any quarter much more effectively.

I have remarked on other occasions of the stability of the Industry. This has never been more apparent than at this period, and prices of our stocks have more than shared in the general advances made by first-class investments. Gas stocks have never been so active. The views of a financial correspondent of a certain paper may be of interest, for he recently considered them more attractive than those of our immediate competitor, electricity.

This correspondent's reasoning was based on the fact that the coals used by electrical power stations would soon cost them more, and there was also to be taken into account the burden of the grid which was annually apportioned among the various supply undertakings.

In view of the prevailing conditions in the stock markets and the abundance of cheap money available, I seriously suggest to those of you in the position to extend your areas and your works to do so—never will there be a time more favourable than this from every angle. It may be that your plant requires modernizing—do that if you cannot expand.

Our Industry has been subject of recent years to a great deal of change by way of groupings and amalgamations. Such movements were all to the general good so long as they were managed and remained in the hands of men who were gas-minded and had a wide knowledge of the Industry.

British Gas Federation.

It had been realized for some time that there was no body or association wholly representative of the Gas Industry in all its branches. We have our National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association, the Society of British Gas Industries, and our own Association.

The need for such a body had been stressed since the return from their tour last year of the delegation from the Institution of Gas Engineers, who had been very much impressed by the work of the American Gas Association.

The initial step towards this end was recently taken at a meeting on Sept. 27 last at which representatives of this Association attended. There is no necessity for me to remind you that we as an Association will support any body whose object is the welfare and advancement of that Industry with which we are all so intimately connected.

Your representatives had no mandate to commit any of you to membership of the Federation without your being individually consulted. Therefore this Association's name has not been included in the Federation till such time as that has been decided.

A motion will be submitted for your consideration as to which course you desire to take.

Gas Legislation.

(*a*) *General.*—At this time last year we, as an Association, were very much concerned over the position brought into prominence originally by the Kettering Company, and

desired, by whatever means we could call up to achieve that purpose, to make the "Kettering Clause" of general application. The point was not before the Gas Legislation Committee and we felt the injustice of the position so keenly that the most serious consideration was given to the possible introduction into Parliament of a Bill satisfactorily dealing with the point.

The further difficulty then arose that we might prejudice our case by pre-estimating the provisions of the Bill about to be introduced by the Board of Trade carrying into effect the recommendations of the Gas Legislation Committee. After consideration we eventually came to the conclusion that it might be imprudent to take this step and that it was best to bide our time.

You know the result. When the Board of Trade Bill reached the Commons from the House of Lords a modified form of the principle was inserted and eventually became Section 27 of the Gas Undertakings Act, 1934. The Section is not what we should have liked, for it fails to remove the restrictions retrospectively and operates only with regard to instruments in connection with the sale or letting of property made after the passing of the Act. Cases may therefore arise for many years to come resulting from long tenancies of Council property, but these should, within a few years, become comparatively rare. I think we have achieved our object and should proceed to consolidate our position.

(*b*) *Gas Undertakings Act*, 1934.—This year has been memorable, for during the period under review we have seen most of the unanimous recommendations made in the reports of the Gas Legislation Committee become law. Such a happy termination to this Committee's labours gives me personal pleasure, for I had the honour to serve on that Committee.

The Bill was introduced into the House of Lords on Feb. 22, 1934, and from that date until it received the Royal Assent on June 28, your representatives were actively engaged in the consideration of its provisions as amended from time to time. This Act is definitely a valuable contribution to existing legislation on the subject and can be of considerable assistance to undertakers in general.

I do not intend to trouble you with the actual details of the measure, except to say that we are given more freedom in the issuing of stock. There are a number of very useful sections covering practical difficulties that were wont to recur and provisions for bringing into line non-statutory undertakings. It is a matter of general regret, however, that the recommendation to impose a minimum charge was not included.

Some of the provisions are entirely additional to the Committee's recommendations, and had not been enjoyed by any undertakers, while others which previously had to be sought by Private Act of Parliament or Special Order at the applicants' own expense are now made of general application.

Slum Clearance.

Considerable injustice and loss appeared probable to certain member companies, following on the decision by local authorities to clear the slum areas under their jurisdiction and to erect large blocks of flats with all-electric equipment.

The efforts to overcome this insidious attack by the electrical committees of the councils concerned will be more difficult to counteract than would at first sight appear, for the specification could be drawn to cover not merely the actual construction of the buildings themselves but the wiring of every room for all purposes.

The crucial point is that once dwellings of this character have been erected it will be next to impossible to introduce a gas supply, and, as the position stands at present, the gas undertakings affected are given no opportunity to make a supply available.

Such a policy results in wholly negativing the benefits of Section 27 of the Gas Undertakings Act, without any illegal infringement of its terms, for here the tenants are practically precluded (except at a prohibitive cost) from the advantages of a gas supply.

The Committee therefore appointed a sub-committee to deal with this vital matter, and instructed our Acting Secretary to communicate with the Ministry of Health suggesting that it should be made compulsory for notice to be given to the public utility undertakers who supply properties liable to be so dealt with and in which they had mains, pipes, and other apparatus, of the intention to demolish them.

Electricity (Supply) Bill.

This Bill, which consisted mainly of a number of practical provisions facilitating electrical supply, was introduced into the House of Commons in the early part of the year. The National Gas Council, with whom we kept in close association throughout the negotiations, had agreed all amendments with the promoters, and the Bill was unobjectionable so far as we were concerned.

On reaching the Committee stage the measure had an unfortunate time, and the Consideration stage was not completed. There was no alternative therefore but to drop the matter. It may, of course, be revived towards the end of this year; but this is doubtful.

Road and Rail Traffic Act, 1933.

Last year saw the placing on the Statute Book of the very comprehensive Act of this name, designed to regulate and superintend, *inter alia*, the conveyance of goods by road vehicles and govern the hours of work of lorry drivers.

The Section which particularly affected utility companies was Section 16, which involved the keeping of rather complicated records as to hours of work, journeys undertaken, loads, and descriptions of goods carried.

Your Association at once realized the enormous amount of seemingly unnecessary work that this would involve us in, and took such active steps as your Committee advised, for it was felt that on account of the peculiar nature of our transport work, as we were public servants, and as our drivers were well treated, we, therefore, should be entitled to exemption from these demands.

The Committee instructed the Acting Secretary to point out such view to the Minister of Transport, requesting him when drawing up the Regulations under the Act to provide for the general exemption of gas companies. A circular on this subject was forwarded to all members, together with a copy of the letter to the Ministry, which suggested that any company affected by the Act should approach the Traffic Commissioners for their area with a view to claiming exemption.

The draft Regulations were issued some time later, but seeing that the Conjoint Conference of Public Utility Associations had been similarly concerned on behalf of all affected—and we were so intimately associated with that body—it was decided not to proceed independently with our representations to the Ministry. A further circular was sent out to our members advising them of the position and that they should apply for exemption on the Regulations coming into force on Oct. 1.

The Conjoint Conference is continuing the negotiations, but the latest information is not very hopeful, for it is felt that great difficulty would now be experienced in making such an application.

South Downs Preservation Bill.

Owing to the rapid development of certain areas near the South Downs, there appeared to a certain section of the local authorities to be a great likelihood of a type of development taking place which would interfere with the general amenities of the Downs as then existing. Very comprehensive provisions were drawn up which would have rendered among other things the making of utility supplies almost impossible. As was to be expected, this Bill met with considerable opposition, even from the Brighton and Hove Corporations.

The attention of our members likely to be affected by any of the Bill's provisions was accordingly drawn thereto. The latest information as to the position of this Bill is that the Committee had decided that the Bill should not be further proceeded with.

Middlesex County Council Bill.

This County Council Bill was similar in many respects to other county council bills promoted within recent years—*e.g.*, Essex County Council, Surrey County Council, &c.

In order to protect the interests of the water industry and that of our own, several amendments were put forward on behalf of those industries, which were acceptable to the promoters, who also agreed to delete the provision as to the method of charge for electricity fittings in certain cases to which we had definite objection. In view of the success attained, it was not necessary to oppose the Bill in Committee.

Petroleum (Production) Bill.

This Bill was introduced into the House of Lords in March last with the object of vesting in the Crown the ownership of any petroleum or natural gas that should subsequently be discovered in Great Britain and restricting the right to search or bore for either article unless with the licence of the Board of Trade.

This matter had the very earnest attention of your Committee, who were satisfied that we were adequately pro-

tected and that no action was therefore necessary. The Bill became law on July 12.

British Industries Fair.

Owing to a certain amount of dissatisfaction caused by the alterations in the date of the Fair at Castle Bromwich and the unsuitability of the available space at London, the National Associations declined to organize an official Gas Section at the 1935 Fair. Since that time your Association received a suggestion from the Society of British Gas Industries for the holding of a Triennial Exhibition in London instead of the Industry being represented at the Fair. A Joint Committee representing the National Bodies was set up to consider the whole question in relation to the 1936 Fair, and after discussion they were of the opinion that the Gas Industry should continue to be represented. Your Committee are still deliberating over this matter and have not yet reached any final conclusion.

Mains and Cables in Highways.

Members will no doubt recollect that in May, 1925, a Joint Negotiating Committee was set up in an endeavour to reconcile the fundamental differences of opinion that have existed and still exist between local authorities and utility undertakers on this matter.

This Committee was composed of representatives from the various highway authorities and the gas and electricity interests, and throughout their deliberations they had to be always mindful of the fact that an equitable solution of the very obvious difficulties was expected. Their suggestions therefore have to be regarded in the spirit of compromise which alone will carry along this " hardy annual " to a successful conclusion.

The National Gas Council prepared a memorandum on the draft clause, the outcome of the Negotiating Committee's endeavours, and this memorandum, together with the revised draft clause and observations prepared by the Acting Secretary, received a great deal of attention, and several members of the Committee forwarded their views in writing to the Association. The Conjoint Conference had invited constructive criticism of the clause. With that object your Acting Secretary was instructed to epitomize his observations and the views of members of the Committee, and to communicate these to the Conference for their assistance.

It is to be hoped that this problem, perhaps the greatest of the many encountered by our Industry, can now proceed to an amicable settlement.

Alteration of Mains.

There had been brought to the notice of the Association several cases of hardship owing to the action of a county council or local authority who, having made alterations in a road surface which involved the subsequent lowering or deviation of its mains by the gas company, had refused to bear the whole or any part of the cost.

Seeing that the problems were very dissimilar and the attitudes adopted by the highway authorities so widely divergent, it was considered essential that a circular letter be issued to members asking for their particular experiences in this difficulty. A large number of replies having been received, the information was collated and forwarded to the Conjoint Conference to whom it should be of great use in their dealings with the highway authorities over the proposed clause.

Income Tax.

(*a*) *Allowances for Obsolescence and Depreciation.*—The Income Tax Sub-Committee have had several cases which necessitated an interview with the Chief Inspector of Taxes, and although a certain amount of success has been achieved, the Sub-Committee have yet to submit their full report.

(*b*) *Unemployment Grants.*—A matter of considerable importance had occupied the attention of this same Sub-Committee and of the Committee following on the action of the Inland Revenue Authorities instructing their Inspectors of Taxes that a distinction was to be drawn between the Seaham Harbour Case and those falling under the Development (Loan Guarantees and Grants) Act, 1929, where the grant was one of interest on capital expenditure.

This resulted in demands being made on a number of public utility companies, including several member companies, in respect of money granted by the Treasury under this Act for approved work designed to provide employment.

In collaboration with the Conjoint Conference, a circular was issued to those members of the Association who were not members of the National Gas Council inviting their financial assistance in contesting a test case on this important question, which was advised by the opinion of eminent counsel. The following month, however, a small gas and water company, very ill-advisedly, if I may say so, took the point before the Special Commissioners without even informing the Conjoint Conference. Their case was not argued as adequately as we should have wished, and no reference appears to have been made to the very points which had been dealt with in the opinion of counsel before referred to.

The Commissioners decided that tax was payable on the ground that the grant was to be regarded as a " trade receipt " not covered by the Seaham Harbour Case. The immediate result of this was that Somerset House sent instructions to its local Inspectors that the question had been settled in the Revenue's favour by this decision and that national negotiations must be regarded as concluded.

Your Association at once sent out another circular warning members of the inaccuracy of such statements made by the Revenue Authorities and that liability for any tax thereon should be repudiated until they heard further from this Association.

The action of the company concerned is to be deplored, and should serve as an example to us all not to proceed in such vital matters as an individual company but as an Association capable of adequately contesting such cases, and so prevent the formation of very doubtful precedents that would certainly be used against us on a later occasion.

British Standards Institution.

The Association was invited to nominate a representative to serve on the Technical Committee of the British Standards Institution which was in course of preparation to compile a glossary of the terms in use in the Gas Industry.

We were fortunate in having Mr. H. D. Madden (Engineer and Manager of the Cardiff Gas Light and Coke Company) available, and the Committee unanimously decided to appoint him to act as our representative in this capacity.

During the year the Institution had issued the British Standard Specification covering steel spigot and socket pipes and specials for gas, water, and sewage. A circular recommending the adoption of this Specification wherever possible was forwarded to members, together with information as to where copies could be obtained.

Conjoint Conference of Public Utility Associations.

Once again I have to record our very happy relations throughout the year with this Conference, with which we are so closely connected. Many matters had been undertaken through their instrumentality, and they were ever anxious to be of assistance to us.

We welcomed to the office of Vice-Chairman our friend and colleague, Mr. F. J. Bradfield, and, as a member of the Committee, Mr. J. B. Brown, a Director of the Wandsworth and District Gas Company. I regret to announce that during the year we were asked to accept the resignation from the Committee of Mr. Wilfrid Wastell. On your behalf, I welcomed Mr. E. J. K. Fussell (Secretary of the Tottenham and District Gas Company), who was appointed to the vacancy.

The Income-Tax Sub-Committee suffered a grievous loss in the much lamented death of Mr. Frank Day (Secretary of the South Metropolitan Gas Company). Mr. Day had worked for over ten years on that Committee and rendered yeoman service. His was a fine nature, and we who worked with him will ever remember the many pleasant associations in this self-imposed task of furthering our Association and its work. In his stead we have Major Barnett (Chief Accountant of the South Metropolitan Gas Company).

As occasion arose, individual advice and assistance has been given whenever requested, by the Committee and officers on a great variety of matters, a few of which are briefly mentioned in the report, and serve to show the wide range of difficulties encountered.

An increasing amount of valuable service has been undertaken by the members of your Committee and its chosen representatives on many diverse bodies, and I desire once again to record our thanks and appreciation for all the responsibilities they have so willingly accepted and satisfactorily accomplished on our behalf.

The Association increases in its value and service to members. This is our 37th Annual General Meeting, and the year now concluded has been one in which our prestige has been well maintained, and, if possible, supplemented. My confidence in your representatives has been wholehearted. They are colleagues with whom it is a continual pleasure to be associated, and I know full well merit the confidence we repose in them.

I now formally move that the Committee's Report and Accounts for the year to Sept. 30, 1934, be approved and adopted, and that the report be entered on the minutes.

The resolution was seconded by Mr. F. J. BRADFIELD (Commercial Gas Company), the Vice-Chairman, who said

he was sure they would all agree that they had a very admirable survey of the past year from their Chairman.

Sir JOHN FERGUSON BELL (Derby Gas Light and Coke Company) remarked that this Association should strenuously oppose the action taken by many county councils in trying to clear themselves of their obligations in respect of alterations to roads. Such authorities forgot that these mains were already very heavily rated. Several small undertakings had indented in their contracts not to claim in such cases; but these were non-statutory companies, and it behoved statutory concerns to ensure that they received full compensation for alteration to their mains. They were quite willing, he said, to carry out such alterations at cost price. Referring to the section of the Chairman's address regarding income-tax allowances, Sir John remarked that in his case if plant was removed entirely the authorities gave him an allowance. The matter concerning slum clearance mentioned by Mr. Edwards was a very serious one for gas companies, and they must strenuously oppose any such action on the part of councils as their Chairman had instanced.

Mr. W. S. MORLAND (Gloucester Gas Light Company), also referring to the matter of altering mains in roads, said that the Act of 1847 stated that "Authorities *may* give notice . . ." But it did not say that they *had* to give notice. They had occasion in Gloucester to take up and re-lay an 18-in. main in the principal street the surface of which the Council decided to lower and concrete. They had informed the Gas Company that if they considered that their mains would be safe under the altered conditions they would be perfectly satisfied; but the Directors would not run the risk of involving an explosion, and they re-laid the main at a cost of several thousand pounds as a result of the Act not being definite on the subject.

Mr. E. J. K. FUSSELL (Tottenham and District Gas Company) said that he considered the Directors of the Gloucester Company should have indicated to the Corporation their views in regard to their rights, and should then have proceeded to alter the main after informing the Corporation that they would hold the latter responsible for the cost of doing the work. If they had subsequently gone to law over the matter, he was sure they would have won their case, as the Act stated that once a main was laid legally a company had the right to repair or renew it, and if the main had to be altered without any wish or desire on their part or the part of the inhabitants the undertaking could claim against the cost of carrying out the work.

Mr. R. J. AUCKLAND (Cardiff Gas Light and Coke Company) also thanked the Chairman for his excellent address, to which he had listened with great pleasure. The position of their Association was sound, and they had done good work during the past year.

The CHAIRMAN remarked that the matter of altering mains, to which reference had been made, was still *sub judice*, so he would not comment further on it; but it was possible that a ruling would be made.

The motion for the adoption of the report and accounts was then put to the meeting and carried unanimously.

Elections.

On the proposition of the CHAIRMAN, seconded by Mr. BRADFIELD, the President of the Association (Dr. Charles Carpenter, C.B.E.) was unanimously re-elected, while the following Vice-Presidents were also re-elected: Mr. R. Bruce Anderson, Mr. R. G. Clarry, M.P., and Mr. A. A. Johnston.

On the proposition of the CHAIRMAN, seconded by Sir JOHN FERGUSON BELL, Mr. F. Harding Jones was elected a Vice-President of the Association.

Mr. AUCKLAND proposed, and Mr. J. B. BROWN (Wandsworth and District Gas Company) seconded, the re-election of the following members to the Committee: Messrs. C. M. D. Belton, H. E. Bloor, E. J. K. Fussell, W. Phillips, and G. Stevenson.

The CHAIRMAN said that the Committee had invited the British Gas Light Company to nominate a member to serve on the Committee, and they had nominated Mr. A. J. Mumford (the Secretary of the Company), and he had pleasure in proposing his name for election.

Mr. BELTON seconded this resolution, which was unanimously agreed to.

The Association's Auditors (Messrs. W. A. Scott & Co., Chartered Accountants) were re-appointed on the proposition of Mr. MORLAND, seconded by Mr. FUSSELL.

British Gas Federation.

The following motion was then submitted to the meeting:

> That the Committee be, and is hereby, authorized, should it subsequently see fit to do so, to take the necessary steps for the Association to join the British Gas Federation.

Sir JOHN FERGUSON BELL asked for further information regarding the Federation, in reply to which the CHAIRMAN briefly outlined its objects, remarking that he was not aware that any of their members had raised any objection to their joining the Federation.

The motion was then formally moved by Sir JOHN FERGUSON BELL, seconded by Mr. W. E. CATON (Oxford and District Gas Company), and unanimously agreed to.

The meeting then terminated with a hearty vote of thanks to the Chairman on the proposition of Mr. MORLAND, seconded by Mr. BELTON, which Mr. EDWARDS briefly acknowledged.

The Evaluation of Coals

In a Paper presented at the recent congress of the International Gas Union at Zurich, Prof. G. A. Brender à Brandis stated that, in addition to moisture and ash, oxygen must be regarded as an impurity in coal. The oxygen is not only intrinsically worthless but uses up important amounts of carbon and hydrogen during carbonization with resulting formation of valueless water and carbon dioxide, and poisonous carbon monoxide. The oxygen turns up almost quantitatively in the volatile products of carbonization; hence, since the volatile content of coals increases with increasing oxygen content, the value of the volatile matter must simultaneously be reduced. A further result is that the hydrogen content of the gas decreases. If caking index and coke quality were left out of consideration, the conclusion would be reached that the coals richest in volatile matter are most suitable for use in the manufacture of gas. In actual practice, the reverse is the case, the reasons for this being as follows:

(1) The quality of the volatile matter decreases as its quantity increases.

(2) Due to the greater formation of water, the gas yield does not increase proportionately to the increase in volatile matter, but increases much more slowly. It is thus conceivable that, over some ranges, no increase in the gas yield occurs.

(3) It is thus clear that the therm yield is not dominated by the volatile content of the coal, and it seems likely that the therm yield is not even influenced by it.

(4) At most, volatile matter content serves merely to classify coals, and it does not enable them to be evaluated.

Hitherto, the significance of the oxygen content of coals has been relatively disregarded, one reason for this being that a method for the direct determination of the oxygen content was not available and the oxygen figure obtained as a difference bore all the errors of the remaining determinations. Now, however, direct determination of the oxygen content of coals is possible—namely, by the ter Meulen method. This method has been employed by the author in connection with the examination of the properties of twelve different English and foreign gas and coking coals ranging in volatile content from 40·6 to 24·2% on the dry ash-free basis. The determinations included volatile content, assay for make, composition, calorific value, and therm yield of gas by the Geipert method, oxygen content, and distribution of the oxygen in the carbon dioxide, carbon monoxide, and liquor formed in the assay test. The results are compared on the basis of yield of therms divided by percentage volatile content. This index rises progressively from 2·01 to 3·14 as the volatile content falls from 40·6% to 24·2%. The oxygen content of the coals shows a comparatively regular fall from 9·6% to 5·4% on the dry ash-free basis; the carbon dioxide content of the gas falls from 2·8% to 0·6%; the carbon monoxide content decreases from 13% to 5%; and the hydrogen content rises from 50% to 65%. The methane content remains relatively constant. The distribution of the volatile oxygen is as follows: In the CO_2, 10-11%; in the CO, 32-35%; and in the H_2O, 55-60%. Evidently, as much as 70% of the volatile oxygen may be present as useless matter. These results bear out the conclusions set forth earlier in the Paper.

The Science and Practice of Gas Supply

By Arthur Coe.

Volume I.

Reviewed by

E. W. SMITH, C.B.E., D.Sc., F.I.C.

In a general review of this work [Halifax, 1934. The Gas College; pp. xiv. + 408. Price, 42s. net] in the "JOURNAL" of Oct. 24, the writer indicated that he would later deal with the three volumes individually. He now discusses the first volume in detail.

The first chapter deals with such fundamental subjects as the origin of the earth; the primary and derived units of measurement; the states of matter; density and specific gravity; the conception of matter; energy, work and power and the transmission of pressure; the nature of air and the phenomena of combustion and respiration; thermometry; specific heat; thermal expansion and chemical energy. It then passes on to a consideration of the geology of coal; the nature and the different types of coal and the coal reserves of Great Britain and of the rest of the world.

Chapter 2 is devoted to gases—the gas laws; the derivation of the Gas Referees' formula for the correction of gaseous volumes; gaseous diffusion and its application in the determination of the specific gravity of gases and in the gas leakage indicator; the effect of altitude on gas pressure.

The third chapter is concerned with gas-works practice and with the properties of the products from the carbonization of coal. The laws of chemical combination are elaborated with especial reference to combustion; the use of the Boys calorimeter is described; the contribution of the Gas Industry to the solution of the smoke abatement problem is emphasized; and the therm basis for the sale of gas is made clear.

The next chapter introduces the subject of distribution with an explanation of the pressure thrown by the holder, the motive power involved in the transfer of gas from the works to the consumer, and the principle, use and location of governors. The relative merits of steel and cast-iron mains and the corrosion of mains are discussed and the technique of main-laying is described.

In chapter 5, the flow of gases through pipes is discussed and the interdependence of potential, kinetic and pressure energy is made clear. The importance of a thorough comprehension of this cannot be over-emphasized. Much attention is devoted to Pole's Formula and its implications.

Chapter 6 is devoted to internal carcassing and gives particulars of the fittings employed, while the succeeding chapter deals with gas meters, special consideration being given to their mechanism and the methods available for testing them. An excellent account of prepayment meters is a valuable feature of this chapter, as is also the discussion of the use of air in the testing of meters.

The final chapter provides an account of the principal methods of ventilation and is introduced by a description of the physiology of the human body. The moot question of the extent to which vitiation of the air of factories with carbon dioxide is permissible is fully discussed.

A lengthy appendix containing tables of useful data and a comprehensive index complete the volume.

Value to Students.

The utility of the work to students is increased by numerous examples of calculations affording a practical guide as to the manner in which the various formulæ developed in the book are applied. These calculations are set out in such detail that the student will have no difficulty in following the reasoning employed.

Some fifty years ago, in "Patience," W. S. Gilbert summed up, in his inimitable way, the numerous qualifications which are expected of the heavy dragoon. The gas supply engineer must have an equally great versatility, as Mr. Coe has fully realized. He needs to know something of chemistry, physics, geology, biology, physiology, engineering, mechanics, mathematics, and several other subjects. Mr. Coe has not attempted to crowd all the essential knowledge into a nutshell, but he has compressed it into one treatise and has thereby saved the student the necessity for consulting a veritable library of books. His method is a particularly good one. Each phase of the subject proper is introduced by a section which explains the scientific basis on which it is founded. An illustration of this is afforded by the discussion of the physiological processes which determine the conditions essential to the achievement of bodily comfort. On the proper understanding of these processes the whole art of ventilation and artificial heating depends. Similarly, in connection with the design of burners, a proper grasp of the energy relationships of gases is essential. Mr. Coe has not only fully realized the necessity for including these essential points but has succeeded in making them interesting. The difficulties which students often encounter are smoothed over in a remarkable manner. Thus the explanation of the action of dry meters is presented in such a way that the student will master the principles involved without realizing the great amount of thought which the author must have devoted to the matter to enable this intricate question to be made so readily intelligible. The presentation of the subject is improved still further by the admirable diagrams which are liberally scattered throughout the volume. In these diagrams the author has often departed from traditional lines and has adopted a method of his own which simplifies matters enormously.

Every Aspect.

So far as can be seen, the author has covered every aspect of the subject, and that, too, in a manner never attempted previously. He has, virtually, developed a new science, that of gas supply, and he has, in consequence, conferred a boon of inestimable value on the Gas Industry. The wealth of vast fields of unco-ordinated knowledge has been thrown into the melting pot, and all the elements have been alloyed together into a sound structure. Mr. Coe has indeed followed Gilbert's advice, which may be misquoted as follows:

> "Take of these elements all that is fusible,
> Melt them all down in a pipkin or crucible,
> Set them to simmer and take off the scum
> And a Gas Supply Man is the residuum."

With a grasp of the contents of Mr. Coe's treatise, the student should have no difficulty in passing the examination of the Institution of Gas Engineers in "Gas Supply" or the examination of the B.C.G.A. in the "Economics of Gas Supply." In fact, it may, perhaps, not be too much to say that these examinations will acquire a new status from now onwards in view of the availability of such excellent material on which a course of instruction or study can be based.

The present volume brings the subject to the stage at which the gas supply is connected to the consumers' appliances. In the succeeding volumes, the domestic and industrial uses of gas are considered. [*In a subsequent issue the writer intends to discuss the contents of the second volume which is now available.*]

National Survey of Britain's Power Resources.

Addressing members of the National Liberal Club on Nov. 8, on the organization of power production, Mr. Ernest Brown, M.P., Secretary for Mines, raised the question of a national survey of Britain's power requirements.

"It was known generally," said Mr. Brown, "that a large quantity of surplus coke oven gas was available in the Midlands area, but that was not sufficient to justify proposals for the construction of a gas grid. It was necessary to establish the facts concerning a number of other considerations, and this required a detailed investigation by a committee aided by technical assistants before it was found possible to recommend the construction of the Sheffield Gas Grid. Similarly, although it may be claimed that a survey of the power requirements of the country and the best means of meeting them ought to be undertaken, preliminary investigations would be required in order to establish whether such a survey was practicable, and would furnish information which would be of value.

"The question is one which some of the more important fuel-using industries might well consider through their research organizations and fuel committees. If it were made clear that a useful purpose could be served the means by which the survey should be carried out could then be considered."

The Marketing of Coke

By F. M. H. TAYLOR, Ph.D., M.Inst.Fuel, M.I.H.V.E.

Dealing with theoretical aspects affecting the design and operation of coke boilers and furnaces

The Combustion of Coke (2)

Any series of articles on the theoretical aspect of the combustion of coke would be incomplete without treatment of the hand-fired sectional heating boiler, which represents perhaps the greatest coke market available to gas undertakings.

The hand-fired sectional boiler, it will be gathered from the article in the "GAS JOURNAL" for Sept. 26, does not compare favourably in efficiency of operation with the hopper-fed boiler on account of its uneven fuel bed, as against the constant fuel bed depth of the hopper-fed boiler. This is chiefly because the formation of carbon monoxide varies according to the thickness of the fuel bed, or in reality according to the time which has elapsed since the boiler was last charged. The variation in carbon monoxide between two charging periods is shown in fig. 1.

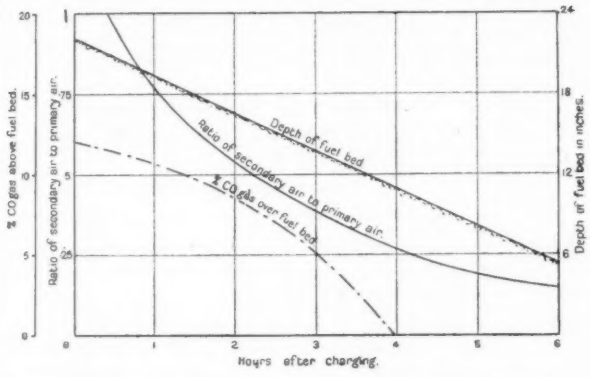

% CO gas above fuel bed.
Ratio of secondary air to primary air.
Depth of fuel bed in inches.
Depth of fuel bed
Ratio of secondary air to primary air
% CO gas over fuel bed
Hours after charging.

Fig. 1.—Showing the proportion of carbon monoxide and the relative proportion of secondary to primary air for various stages of combustion in hand-fired heating boilers in between two charging periods.

It can be seen that shortly after a charging period, as soon as the freshly charged fuel has been warmed up to nearly 1,600° F. (860° C.), a temperature most favourable to the production of carbon monoxide, the maximum quantity of carbon monoxide is formed and a larger proportion of secondary to primary air is required. As the fire burns away, the fuel bed depth decreases, the proportion of carbon monoxide is lessened, and consequently the proportion of secondary to primary air also decreases. By placing a secondary air inlet in the main cleaning door actually below the top level of the fuel bed, secondary air can be admitted to the fire in such a manner that it is warmed immediately on entering the firebox.

Carbon Monoxide Prevention Doors.

The proportion of secondary air admitted by the carbon monoxide prevention doors is approximately one-fifth of the total amount of air, and the size of the slots is such that it is not possible to admit more than this quantity. The temperature of the air is raised to between 200° F. and 500° F. (95°-260° C.) according to the rate at which the boiler is worked. The preheated air is naturally the more reactive and therefore more effectively burns off the carbon monoxide formed as well as the quite small quantities of hydrogen and methane present in the coke, which are driven off shortly after the boiler is fired.

It is obvious that with a thick fuel bed the resistance to primary air will be considerable, so that a greater proportion of secondary air will be admitted into the firebox and the carbon monoxide generated from the piled up fuel bed will be completely consumed. As the fire burns lower and the fuel bed decreases, the resistance to primary air also decreases, and the proportion of secondary to primary air is reduced while the quantity of carbon monoxide generated is also reduced, as previously explained. These two factors balance sufficiently closely in actual practice to give nearly the correct proportions of secondary air and carbon monoxide right through the inter-charging period, with a consequent increase in the carbon dioxide content of the flue gases, and in the efficiency of the boiler. In other words, a very large excess of secondary air is prevented when the fire has burned low, while sufficient is available to burn off all the carbon monoxide in the initial stages of an inter-firing period. This is shown in the readings taken between two charging periods. The two carbon monoxide percentages, with carbon monoxide prevention doors and without them, are given. An actual test carried out by the boiler makers shows that a reduction of the carbon monoxide content of the flue gases of from 2·5% down to 0·5% has been made, giving a fuel saving of as much as 10%. The actual carbon dioxide readings are shown in fig. 2. Details of a test are given.

Test on Sectional Boiler, With and Without Carbon Monoxide Prevention Doors.

Coke. Size 3 in. by 4 in. approximately—			
Weight	28 lbs. per c.ft.		
Ash	9·5%		
Moisture	2·8%		
Calorific value (dry state)	12,940 B.Th.U. per lb.		
Boiler. No. 38 K Ideal Britannia—			
Heating surface	115·5 sq. ft.		
Grate	8·66 ,,		
Date	13.2.33	..	15.2.33
CO prevention doors	In operation	..	Sealed
Boiler output, B.Th.U. per hour.	501,157	..	482,837
Draught in smokehood.	0·16 in.	..	0·17 in.
Temperature in smokehood	509° F.	..	592° F.
Boiler efficiency	75·7%	..	73·2%

These figures were obtained by the courtesy of the National Radiator Company, and refer to tests carried out in their laboratories.

This is equal to a fuel saving of 3·4% taken over the full period; the large coke used was hard and relatively unfavourable to the formation of carbon monoxide.

The Size of Fuel.

It should be borne in mind, however, that this delicate adjustment of the secondary and primary air may be thrown out completely by fluctuations in the size of fuel, by clinker formation, or by the rate at which the boiler is operated, and is by no means as sure a method of obtaining a guaranteed high efficiency as the constantly controlled thin fuel bed depth of the hopper-fed boiler.

Heat Transfer Efficiency.

The efficiency of a boiler depends partly on the transfer of radiant heat and partly on the transfer of convected

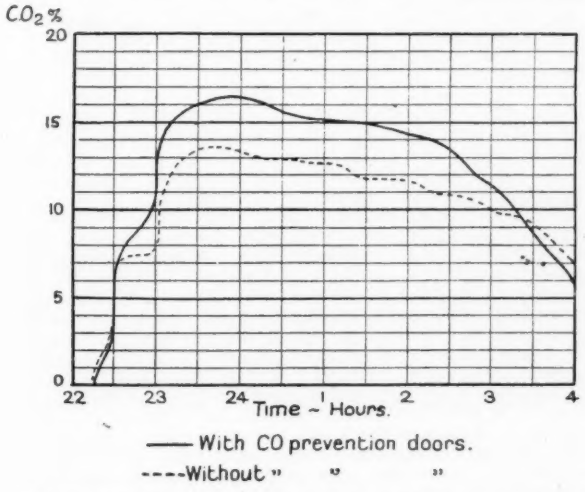


Fig. 2.—Carbon dioxide percentages for a hand-fired heating boiler during a six hour intercharging period with and without carbon monoxide prevention doors. (By courtesy of the National Radiator Co.)

heat. On the normal type of central heating boiler radiation is the most important. Radiant heat is transferred either from the hot fuel bed or from the hot flue gases

direct on to the boiler walls and flues. The efficiency of this transfer depends on:

(*a*) The temperature of the fuel bed or gases.
(*b*) The size of flues or combustion chamber through which the gas would have to pass.
(*c*) The proportion of solid matter held in suspension by the flue gases.

Heat Transfer by Radiation.

Fig. 3 shows in graphical form the relative importance of radiant heat transfer under various conditions of tem-

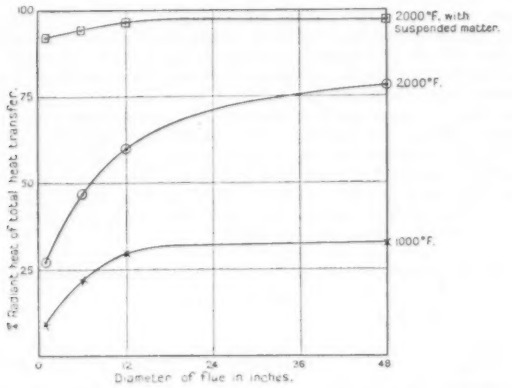


Fig. 3.—Graph showing the effect on the proportion of radiant heat to convected heat transfer of size of flue, temperature of gases, and the presence of suspended matter.

perature, size of flue, and presence of solid matter. The figures given are taken from the following table:

Table Showing the Relative Importance of Heat Transfer by Radiation and Convection in Boilers.

Size of Pipe.	% Radiant Heat to Total Heat Transfer.		
	At 1,000° F. (540° C.)	At 2,000° F. (1,090° C.)	At 2,000° F., with Suspended Matter.
1 in.	9	26	92
6 in.	22	47	94
12 in.	30	60	97
48 in.	33	78	97

These figures were obtained from "The Calculation of Heat Transmission," by Fishenden & Saunders, H.M. Stationery Office, 1932.

From a study of these results three effects are very clearly shown:

1. That the proportion of radiant heat transfer increases very rapidly with a rise in temperature, which would be expected on consideration of the formula for radiant heat transfer of

$$H = 17{\cdot}3 \times 10^{-10} E (T_1^4 - T_2^4) \text{ B.Th.U./sq. ft.}$$

where H is the quantity of heat transferred, E is the co-efficient of emissivity depending on the surface, and T_1 and T_2 are the temperatures of the hot flue gases and the cold boiler wall respectively.

2. Within the ranges of normal flue gas temperatures of 500° to 1,500° F. (260°-800° C.) the effect of the diameter of the flue passages is seen to be considerable, so that boilers should be designed with flues of as large a size as possible, as the hot gases of temperatures from 3,000° F. down to 1,500° F., which transfer mostly by radiation, need as large combustion space and flueways as can be arranged in the boiler design. Below 1,500° F. the main transfer is by convected heat and the flueways should be of small diameter to give large surfaces and as high a gas velocity as possible without causing undue back pressure.

3. Solid matter in flue gases is seen to exert a very great influence on the radiation from the hot gases, even down to relatively small diameter tubes, gases with a high proportion of suspended matter give black body radiation. This often means three or four times the radiant heat emission than from a perfectly clean gas. Solid matter is always present in flue gases, owing to fine ash particles and small particles of incompletely burnt carbon or soot. Although these are present in very small quantities compared with the amount of fuel consumed they are normally sufficient to give black body intensity of radiation.

Coke v. Coal and Oil.

The high radiation efficiency of flue gases containing suspended matter explains the possibilities of forcing coal fired steam raising boilers at rates which would prove uneconomical on coke fuel. Boilers such as the Economic and Lancashire types have wide flue tubes and depend very largely on heat transfer by radiation from the flames rising from the fuel bed. The smoky coal flame or fuel oil flame, although inefficient from a combustion point of view, does effect a considerable transference of radiant heat to the boiler surface. This is of course at the sacrifice of over-all efficiency, since it is only a smoky flame which gives this effect. A coke flame, however, being only partially luminous, will not give such a high degree of radiation for equal temperature in any circumstances. It is advisable to check carefully the output of the boiler before the adoption of coke fuel on conversion from oil or coal, because unless the bulk of the heat is transferred as radiation, there is no possibility of recovering the heat by convection, as the Lancashire and Economic types of boiler do not have banks of small diameter flue tubes in passage through which the flue gases could give up further heat by forced convection.

Where large flueways or flue tubes are present in the boiler, the heat transmission is very closely proportional to the actual heating surface of the boiler. Where forced convection takes a hand the boiler heating surface itself has relatively little effect, of far more importance being the flue gas velocity and the diameter of the flue. The term "boiler heating surface" used loosely is very misleading, and it is really a pity that it is used in conjunction with the ratings of either central heating or steam raising boilers.

Heat Transfer by Forced Convection.

The formula* due to McAdams and Frost giving heat transfer by forced convection is:

$$h = \frac{23{\cdot}3\,k}{D}\left(\frac{\sigma\,UD}{Z}\right)^{0{\cdot}8}$$

h = Heat transference co-efficient (film) in B.Th.U. per sq. ft. per hour per ° F.
k = Heat conductivity of gas in B.Th.U. per sq. ft. per hour per °F. per foot.
σ = Density of gas in lbs. per c.ft.
D = Diameter of pipe in inches.
U = Velocity of gas in ft. per second.
Z = Viscosity at arithmetic mean temperature of gas in centipoises; k and σ are graduated to allow the use of C.G.S. units when convenient.

*McAdams and Frost, J.I.E.C., 1922, **14**, 13.

It is sufficient to emphasize at this stage that the diameter of the tube and the velocity of the flue gases are all important considerations. Unfortunately, however, with the increase in efficiency of the heat transfer surface by restriction of the diameter and by increase in velocity, the back pressure from the flueways also increases, and unless forced or induced draught is employed it is impossible to employ a highly efficient design of flue tube.

Clinker Formation.

The formation of clinker in coke boilers very often differentiates between efficient operation and operation which is definitely unsatisfactory to the consumer.

Coke contains approximately 10% of mineral matter or ash, which softens or melts at temperatures ranging from 2,000°-2,300° F. (1,100°-1,250° C.). Ash on melting forms a mass of clinker immediately over the grate bars. The factors covering the formation of clinker in boilers, whether they are for domestic, hot water, central heating, or steam raising purposes, may be tabulated:

1. The proportion of ash in the coke.
2. The ease with which this ash falls through the bars away from the hot fire.
3. The temperature of the fuel bed.
4. The temperature at which the ash softens to form clinker, referred to as the fusion point of the ash.

To those concerned with the sale of coke, or in influencing or adapting the design of boilers to make them more suitable for burning coke, the proportion of ash in the coke is not under very close control. Dry-cleaning and washing are adopted for the smaller grades for domestic use, but no serious attempt is made to reduce the ash in the coke very much below the usual figure of 9 to 10%. The fusion point of the ash is again very dependent on the coal.

Ash Fusion Point.

One possible factor affecting ash fusion point is in the blending of coals before carbonization. There is evidence leading to the belief that certain mixtures of ashes depress their mixed fusion point, following the generally accepted psycho-chemical laws of fusion point depressions in mixtures, so that two coals of ash fusion points of, say, 1,200° C. from which cokes of the same ash fusion point

might be expected, when blended occasionally give a coke of ash fusion point of, say, 1,170° C. This difference may mean excessive clinker in central heating boilers, and a treacly clinker in steam raising boilers which runs into the grate bars, very soon leading to their destruction.

The Design of the Grate Bars.

Fig. 4 shows a very suitable design of grate bar for coke. It ensures foremost the maximum amount of free air space. No gap is more than $\frac{3}{4}$ in. across, so that coke burnt down to small pieces would not fall through the bars. By the adoption of as wide an air space as possible, not only is combustion assisted, but every opportunity is given for the ash to fall naturally through the bars before it can soften and form clinker.

The Temperature of the Fuel Bed.

The fuel bed temperature can be affected in three ways:

1. By the rate of combustion.
2. By the thickness of the fuel bed.
3. By the admission of steam under the grate bars.

The effect of the rate of combustion is obvious. The faster the boiler is run the higher is the temperature of the fuel bed, in fact the limiting rate of the boiler is very often that at which the fuel bed temperature is so high that clinker becomes fluid and the further admission of primary air is prevented.

The main influence of fuel bed thickness is that a thin fuel bed is enabled to emit radiant heat to the surface of the boiler and so become cool, whereas thick fuel beds smother the hot zone with further quantities of coke and insulate it from the cold boiler surfaces.

The admission of steam under the grate bars is very effective in steam raising boilers, and an ashpit very often assists a central heating boiler. The steam generates water gas according to the reaction

$$C + H_2O = CO + H_2.$$

This is an endothermic reaction, and the heat absorbed cools the bed sufficiently to prevent the formation of hard clinker. The carbon monoxide and hydrogen so formed are burned off later. The admission of steam may be made very critical, and the degree of friability of the clinker must be taken into account to a nicety when adjusting the steam inlet valves. In boilers of 5,000 lbs. evaporation and over this is of fundamental importance, as the clinker must be hard enough to avoid any running into the grate bars from which it can only be removed with considerable difficulty, and yet sufficiently hard to avoid breaking up on removal. A stoker prefers a firm thin slab of clinker which he can remove from the fire in a few minutes.

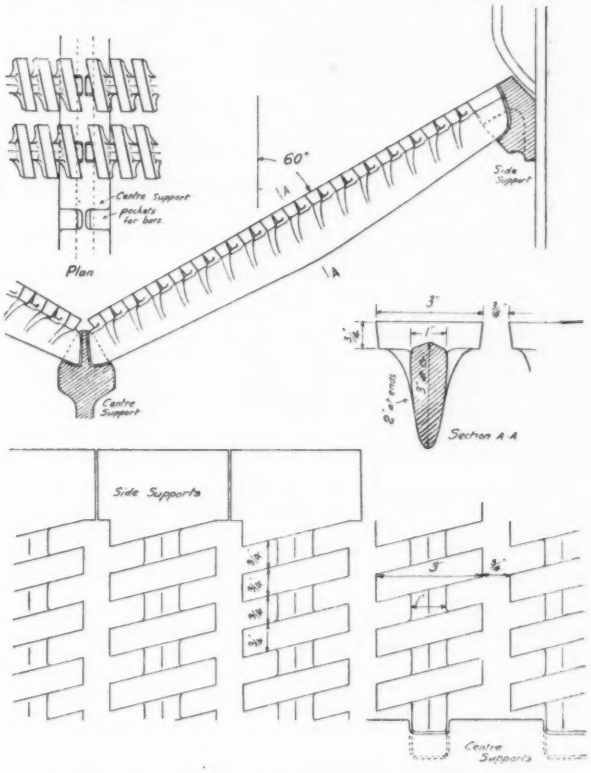


Fig. 4.—Illustration of grate bars, showing suitable spacing for coke firing.

An Avenue of Gas Lamps.

Wandsworth Company's Novel Scheme.

The public lighting superintendent would indeed be hard to please if he could not find on the Wandsworth Gas-Works a design of gas lamp suitable for the illumination of every type of thoroughfare under his jurisdiction.

The Wandsworth and District Gas Company have recently inaugurated a novel scheme at their works, which, if adopted more generally, would be of considerable value in holding and augmenting the public lighting load. Briefly, the scheme, which we were enabled to inspect the other day by the courtesy of the Company, is as follows.

A piece of roadway on the Works about 200 yards in length has been lined from end to end with gas lamps—hundreds of them, it seems, though, in point of fact, there are only fifty-five. It is difficult, at first sight, to interpret any rhyme or reason in this veritable "forest" of lamps, no two of which appear, at the initial casual glance, to be alike. It is only upon a closer inspection that one is able fully to comprehend the ingenuity of the scheme.

Taking us to one end of the road, a representative of the Company showed us the first lamp on the right-hand side, which was, shall we say, a twin burner in square lantern on a 10 ft. 6 in. column. "Now," he said, "look at the sixth lamp down on the other side of the road." We looked; and, sure enough, it was an identical installation. Similarly the first lamp on the left side of the road was repeated six lamps down on the other side, while the second lamp on the right hand side had its counterpart in the seventh lamp on the opposite side, and so on, to embrace in all ten different series of fittings, five on each side.

The principle, therefore, is that here we have a typical stretch of roadway which may be illuminated by any of eleven different types of lamp, with varying numbers of burners from one to fifteen, all with different types of reflectors and lanterns, and at varying column heights from 10 ft. 6 in. to 15 ft. There is, in addition, a series of central suspension lamps, which is fitted complete with lowering gear, and also a series of high-pressure lamps, operating at about 90 in. pressure from a small compressing plant adjacent to the road. An interesting feature of the latter installation is that the lamps automatically light up as soon as the compressing plant is set in operation. It should be mentioned that some of the types of lamps are fitted with automatic clock control and some with distance control, while experiments have also been made with electrical by-pass ignition.

Showing the various types of street lighting fittings.

The columns are set at such a distance apart that each lamp finds its counterpart 150 ft. away in staggered formation. Thus by turning on any series of lamps an adequate illumination of the roadway in varying degrees of intensity may be obtained, while the wide selection of lamp designs enables an excellent comparison to be made between the different systems, and renders the choice of a suitable installation for any type of street an easy matter.

Modern Developments in Gas Meter Construction

A paper read before the Western Junior Gas Association at Bristol on Nov. 3

By A. T. Gilbert, Assoc.Inst.Gas E.
(Technical Demonstrator, United Gas Industries, Ltd.)

It is necessary to introduce this subject with a brief retrospect of gas meter history.

The principle underlying gas-meter construction—namely, volumetric registration—was laid down by the Sales of Gas Act, 1859, as the outcome of the wet meter first patented by Samuel Clegg forty-four years earlier.

Commencing about the year 1830, meters which did not rely upon water as a sealing element, and taking the name of "Dry Meters," were introduced in quick succession. Outstanding examples of designs for such meters, having leather bellows or containers, were produced by Defries, Payton, and William Smith, to mention only a few of the names.

These all perpetuated the idea of utilizing a combination of mechanical devices—namely, flexible gas-tight containers, filled by gas under pressure, their movement operating suitable valves which distributed the gas into the proper channels, to maintain a steady and uniform gas flow.

The content of these leathers being a fixed and known quantity, and being set at so many movements per cycle of the meter's mechanism, it was easy for the volume of gas—so delivered—to be recorded in terms of cubic feet. It thus became established that all gas meters should be constructed on similar lines, and measure actual gas volume, which, after all, is the most equitable method it is possible to conceive.

However, such a regulation had very serious difficulties for the budding gas engineers. In the first place, pressure was so low and meters were so crudely constructed that all the available mains' pressure must have been required to cause the meters to work. It was quite a saving factor that the appliances to be supplied were mostly of the flat flame or argand type, no "bunsenizing" being necessary.

Another factor which was aggravated by measuring volume was that of meter bulk, because, as the demand for gas grew, so the size of the meter had to be increased to deliver the gas, for, to use a commonplace expression, "a quart could not be supplied from a pint pot." Therefore huge dry meters standing over 6 ft. in height, and wet meters of much greater dimensions, were the rule where large volumes of gas were required. Many such meters are still installed in our districts.

Restricted Gasways.

The direct causes for such huge meters were, chiefly, the restricting effect of valves and gasways, and, secondly, the prevalent idea that leather capacity was the main and only consideration. But, as we have learned during the past twenty years, it was useless to fit large capacity diaphragms with restricted valve ports and gasways. In other words, the content of the diaphragms could not enter or leave the meter fast enough. These conditions also had the effect of keeping the number of revolutions at the ridiculous figures of 120 or 240 per hour.

What is "Capacity"?

We must first grasp the two factors: (1) "Revolution capacity" is relative to leather capacity (being four times the content of one leather). (2) "Capacity per hour" is relative to the number of leather movements per hour, and the ease with which the gas can flow through the meter.

To quote a practical illustration of this point, take an old type 3-light meter with gasways of $\frac{3}{8}$-in. to $\frac{1}{2}$-in. bore and $\frac{3}{8}$-in. area valve ports. To this fit a pair of 100-light leathers, and the resulting meter would be very little better than a 3-light, but making only about 6 R.P.HR. at 3-light capacity, and at full bore about 70-100 c.ft. per hour.

Now to reverse the order, take a 100-light meter with gasways average $\frac{3}{4}$-in.-1-in. bore and valve ports of $\frac{3}{4}$-in. to $\frac{7}{8}$-in. area. To this fit a pair of 3-light leathers, and the resulting meter would still be almost equivalent to a 100-light. But to supply the 100-light rev. capacity of, say, 3 c.ft., the meter must make 24 revolutions, which means 4,800 revs. per hour. This result would still be a 100-light meter, and as long as the leathers and valves moved freely, there would be a 100-light meter performance.

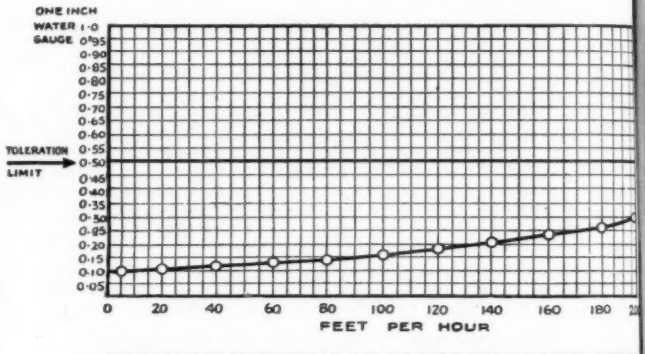
This illustrates pretty clearly what the meter industry has done for the Gas Industry by the design and introduction of the small high-capacity meters. It is now possible to deliver sufficient gas for any domestic demand from a meter of 3-light dimensions, displacing the old 20-light casing of three times its bulk.

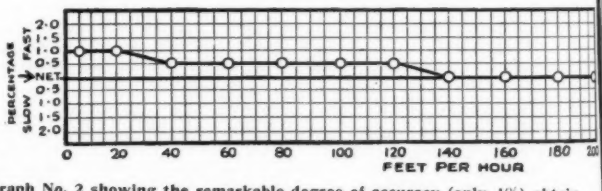
Watch these high-capacity meters for pressure drop, inlet to outlet. It should be as low as possible, which means easy gas flow; and equable registration over a great range usually follows.

Speed and Leather Wear.

There are two bogeys which have been set up against high-capacity meters—viz., excessive wear of working parts, and leather wear, owing to the extra revolutions. But instances have come to our knowledge where 400 or more revolutions per hour have been considered excessive. It is not always realized that an old 3-light meter supplying a slot-cooker may make at least 800 revs. per hour, but *they* stand up to it.

Graph No. 1 showing the pressure absorbed by 100 c.ft. per hour meters of the well-known "Radial" construction, taken from stock.





Graph No. 2 showing the remarkable degree of accuracy (only 1%) obtain from similar meters over a range of 10 c.ft. per hour to 200.

When we refer to speed, in these days of wonderful mechanical contrivances capable of developing thousands of revolutions *per minute*, our gas meters with their few hundred revolutions *per hour* pale to insignificance.

From a life-long experience of gas meter construction and application, I have come to the definite conclusion that more meters break down registering a by-pass, at 1 rev. in two hours or so, than from excessive speed. But, I must add this proviso, always providing that the meter is properly designed and built for wear. Especially does this apply to the diaphragms. It is possible for leathers to go into holes in a remarkably short period if badly assembled, or if leather of ordinary tannage is used instead of the chrome-dressed kind.

Leathers and Chrome Tannage.

For a hundred years it has been proved that the best skin for meter leathers is that of the Persian or East India sheep, but many other fabrics have been experimented with from time to time. Therefore nothing new can be claimed in the modern meter excepting the tannage, which has been decidedly improved, and also the method of assembling the leather to the tin parts.

Tanned abroad, it has been proved that the leather does

Description of Meter.	Badged Capacity.	Ordinary Meter Pressure Loss.	Total Gain.			
			Net Prices Compared and Cash Saving.		Conservation of Useful District Pressure and Increased Efficiency of Consumers' Appliances.	Less Space Occupied on Consumers' Premises.
			Ordinary.	Prepayment.		
		Passing 50 C.Ft. per Hour.	£ s. d.	£ s. d.		
No. 2 standard	0·166/40 c.ft.	5 tenths	2 0 1	2 19 7	3½ tenths	1,440 c.in.
Radial	0·05 /50 ,,	1½ ,,	1 16 10	2 16 4		420 ,,
			0 3 3	0 3 3		
		Passing 100 C.Ft. per Hour.				
No. 3 standard	0·25/60 c.ft.	6 tenths	2 5 6	3 5 0	4½ tenths	1,872 c in.
Radial	0·1 /100 ,, 5-lt. unions	1½ ,,	1 19 0	2 16 4		672 ,,
			0 6 6	0 8 8		
		Passing 200 C.Ft. per Hour.				
No. 4 standard	0·5/120 c.ft.	Over 5 tenths	2 18 6	4 1 3	Over 3 tenths	3,135 c.in.
Radial	0·2/200 ,, 10-lt. unions	Under 2 ,,	2 7 8	3 7 2		1 350 ,,
			0 10 10	0 14 1		
		Passing 200 C.Ft. per Hour.				
No. 5 standard	1·0/210 c.ft.	4 tenths	6 0 3	7 6 3	Over 2 tenths	8,190 c.in.
Radial	0·2/200 ,, 20-lt. unions	Under 2 ,,	2 18 6	3 18 0		1,350 ,,
			3 1 9	3 8 3		
		Passing 400 C.Ft. per Hour.				
No. 6 standard	2·0/420 c.ft.	5 tenths	11 14 0	13 13 0	3 tenths	19 278 c.in.
Radial	0·4/400 ,, 50-lt. unions	2 ,,	5 10 6	6 13 3		2,926 ,,
			6 3 6	6 19 9		

This table shows the many advantages to be gained by the purchase of the new high capacity meters upon the basis of "capacity per hour."

not resist the action of the destructive constituent gases, especially ammonia and oxygen. It was therefore the results of continued experiments which led to the use of chrome as a final tannage.

The process of chroming is to strip out the original Madras tannage as much as possible with a suitable alkali like borax, and afterwards the skins are tanned with any standard one-bath chrome liquor such as is used for box and willow calf. Afterwards the skins are neutralized in order to get rid of the excess of acid in the chrome liquor, and are then drummed with a fat liquor which is a mixture of soap and olive oil.

The result is a leather softer and stronger than the original, but the most important advantage is that it resists the chemical action of gas much more than the old tannage.

The leather is finished by being buffed on both sides, and then cut into the discs for use in meters.

Open or Closed Valves.

Another trend in modern meter construction is to do away with the valve box which caused certain restricting gasways and changes of directional gas-flow, also much additional frictional resistance. The gas can now pass directly into the valve ports. The extra room so obtained also accommodates the larger valves necessary for easy flow.

The risks from the fracture of this gas chamber are no more than the rest of a tinplate casing, especially as our own meters have extra strong and reinforced top plates.

The outstanding advantage is the complete elimination of risk from leaks at the index. The connecting shaft in H.C. meters rotates through its stuffing box, once in 2 ft. Whereas in the old type valve box, the crank revolved sixteen times to 2 ft.

Prepayment Meters.

Remarkable improvements have been introduced in slot meter construction. Just as we were forced to get more gas from our meters, so we are compelled to make provision for prepaying for greater demand also. It is ridiculous to fix appliances which it is hoped will be in great demand to increase gas consumption and then expect your consumer to trail through twelve pennies to get a shilling's worth of gas.

Two-Coin and Two-Slot Meters.

To meet this demand, nothing could be better than the two-coin meter, at consumer's option; the more you help the customer, the more gas they will use.

The type of attachment having two slots is, in my opinion, the best. In the type of meter which I have in mind, a shilling cannot be inserted into the penny slot unless forced, and then it is ejected before operation can be effected.

There are no real objections to two-coin meters, but even though there were, the lighter load of mixed coins, with fewer banking calls and less coins to count, should obliterate them.

The modern trend in meter construction then is to assist the Gas Industry; and you may rest assured that every problem of the Industry is a meter maker's problem, and the closest co-operation must be the rule. The old shibboleths as relating to lights capacity, standard sizes, or fixed penny or shilling meters should not stand in the way of progress in a great Industry.

Discussion.

Mr. F. G. O'NIELL (Bristol) instanced a case of a large gas engine, fitted with an efficient gas bag, giving oscillation in the main near the engine. The meter was of a capacity large enough for the rated gas consumption of the engine, based upon 20 c.ft./H.P., and he thought the oscillation was caused by the meter.

Mr. S. HOLE (Bath) asked what Mr. Gilbert considered the best leather dressing and whether spraying meters was effective in dealing with gummy valves.

Mr. A. B. HORSEFIELD (Bristol) mentioned the failure of back stops with high-capacity meters, and said some more effective method was necessary to prevent meters being connected backwards.

Mr. S. B. JONES (Clevedon) said he was interested in hearing of the damaging effect of ammonia. It appeared that care would be needed at some works to prevent by-passing this compound.

Mr. A. T. GILBERT, in reply, said that the suggestion that oscillation was caused by the meter could be ruled out. He had found it almost common practice for engine meters to be under capacity, in which case the engine acted as an exhauster, instead of the gas being a feeder, and the meter functioned as a gas bag. What was required in such cases was an anti-fluctuator to supply the reserve of volume. It was not always realized that engine meters' capacity should be rated at at least double the theoretical cycle capacity of the engine, because the whole charge per cycle was taken in at one stroke. He admitted that cost had to be considered, but a meter was not an anti-fluctuator, nor should it be used as such. Special apparatus had been designed for that purpose.

The best leather dressing, according to the experience of Mr. Gilbert and his Company, over many years (and this was their centenary year), was a complex of a well-known diaphragm grease, plumbago, and a meter oil; almond oil must be used

sparingly for many reasons. Spraying would not cure gummy valves, and, incidentally, it should be pointed out that gummy, or any other conditioned valves, could not be diagnosed with the meter casing sealed. The spray might dissolve gum and release all moving parts for a short time, but it did not last, and a costly process had to be gone through time and time again. If gum was present, an oil tube fitted to the outlet side of each meter was the best and cheapest remedy. This, operated with an oil pump, converted the valve box into an oil bath, but even this was useless unless re-charged half-yearly or so, systematically, as in the case of the old wet meter.

Replying to Mr. Horsefield, he apologized for omitting the back stop question. There was a legal obligation on meter manufacturers to fit these, unless the meter bore a badge stating "without back stop." A new meter which could move backwards or forwards, and give positive registration was being developed. If meters were fixed in reverse action, it was often due to the proximity of the gas supply. Should the supply be handier to connect to the outlet, it was often an inducement to a careless fitter to connect up that way.

The PRESIDENT proposed a hearty vote of thanks to Mr. Gilbert for his paper and the demonstrations accompanying it. The meter industry, he said, was producing better meters to help the Gas Industry, but there was room for improvement in general appearance. He suggested a sort of streamline effect, with fewer unsightly badges.

Essential Factors in the Promotion of Gas Sales*

By Sir FRANCIS GOODENOUGH, C.B.E.

Technical Training.

I have sketched the professional equipment which is the capital of a first-class gas salesman. Much of the necessary training, especially on the technical side, can be given by the gas undertaking itself, in conjunction with the evening courses held at Technical Schools in the district.

A London example will suit my present purpose best. Eight years ago the Gas Light and Coke Company established at Watson House—named after its Governor and Managing Director, Sir David Milne-Watson—a research and training section which was intended among other things to strengthen the scientific background of the sales organization. Besides testing shops and physical and chemical laboratories, the section included training shops for apprentices (already an established and proved success for nearly 20 years) and for the new recruits who were destined to become district representatives.

The training given in the shops at Watson House is closely linked with the courses of instruction prepared by the Education Committee of the London County Council. In fact, the Education Department of the Council is allowed to use the shops for their evening classes in gas fitting practice.

Many of the lecturers and instructors at Watson House are also teachers of gas subjects at the Westminster Technical Institute of the L.C.C. (My successor at the Gas Light and Coke Company, Mr. Stephen Lacey, is a member of the Advisory Committee of the Institute, of which I have the responsibility to be Chairman, so there is close co-ordination between the employer and the education authority.) Daytime lectures and demonstrations are given periodically to the sales and supervisory staffs. These are confined to one topical subject at a time, and are followed by a talk by a senior officer of the Department, the idea being that the salesman should have in mind first and foremost the use he will make of the information received, and should not feel overburdened with technical information.

Every month a publication called the *Watson House Bulletin* is circulated to the district staff to keep them in touch with technical developments. It may be noted in this connection that several other undertakings keep their commercial as well as their technical staffs supplied with new literature on the utilization of gas.

Training in the Art of Salesmanship.

The provision of technical training is the least difficult problem in the equipment of the gas salesman. The undertaking itself, in conjunction with Technical Schools and the educational scheme of the Institution of Gas Engineers,† will always bear the main responsibility for fitting its salesmen with a firm grip of the technics of gas supply.

It is quite as important—even more important ultimately—to make sure that the individual knows exactly how to use his general and technical knowledge in the actual business of getting orders and keep the goodwill of present customers.

An employee completely equipped with scientific knowledge and technical skill, conversant with the history and policy of the Industry, and primed with accurate statistics as to the relative costs of gas and electricity, is worthless as a salesman unless he knows how to use these tools on the job of attracting, pleasing, and persuading the customer.

Now until about four years ago the British Gas Industry as an organized body had produced no national scheme for training in the art of selling. The nearest approach to a really national plan was the organization by the British Commercial Gas Association of district Salesmen's Circles, at which papers on special aspects of selling were delivered, to be followed by (usually lively) discussion. These Circles are still flourishing, and I may mention that medals are given each year for the best papers delivered during the session.

Yet it was felt on all hands that something more was needed; and in 1930 the B.C.G.A. embarked on the preparation of an ambitious course of training for salesmanship, designed to co-ordinate the most successful sales practices. The work was entrusted to Mr. Harold Whitehead, the distinguished authority on marketing problems who had already co-operated in similar work for the American Gas Association. His staff of experts began with a thorough survey of existing conditions and sales practice in the British Gas Industry.

The Background of a National Training Scheme.

This approach to the problem was similar in principle to the first stage of a laboratory research; that is to say, the course was built up on the foundations of a dispassionate objective investigation, which aimed at gathering all the facts relating to the sale of gas appliances. Theories were left severely alone.

The information was gathered in several ways. Carefully instructed men and women visited gas showrooms as shoppers. They noted accurately what the salesmen said and did, particularly observing the good things. Their first concern was the hunt for sound, practical, and effective sales methods. These shopping experiences were conducted by a number of people of varying age and temperament, so as to build up a complete picture of actual sales practice.

When an unusually clever salesman was discovered, he was interviewed and observed, so that the benefit of his skilled methods could be passed on to other gas salesmen.

Interviews were arranged with the executives of selected gas undertakings and with makers of all kinds of gas appliances. Their experiences and practical suggestions were carefully sifted. To complete the picture, gas consumers of all types were visited and the viewpoint of the customer secured.

By these means the best selling ideas and selling methods of the whole Industry were gathered together. The mass of material was consolidated and analyzed. Sales methods were carefully compared and properly evaluated. It will be appreciated that this work required a background of selling experience and sales judgment as well as trained professional brains to get the maximum value from this material.

At this stage an outline of the course was made, and detailed recommendations were submitted for consideration, criticism, and (finally) approval to a special Com-

* A paper presented to the Colonial Gas Association Centenary Conference in Melbourne, 1934—continued from p. 558 of last week's issue.

† Particulars of this scheme can be obtained from the Secretary of the Institution, 28, Grosvenor Gardens, London, S.W. 1, free of charge on application.

mittee set up by the B.C.G.A. composed of leading commercial experts in the Industry throughout the country.

Operation of the Course in Salesmanship.

The course in Domestic Gas Salesmanship as it was finally adopted contained three elements: Text-books, sales cases, and manuals for the conduct of group meetings of salesmen.

The " units " of the scheme are illustrated handbooks, which are issued to the students, one each month for six months. In style and appearance they differ from the conventional text-book. Nothing could be less like a " crammer's " course. The titles of the handbooks give some idea of their contents:

Selling from the Customer's Viewpoint.
Guiding the Selection.
Convincing the Customer of Value.
Selling More Gas.
Overcoming Difficulties.
Reaching the Larger Market.

The books are conveniently sectionalized and written in a lively style. They include panel pages set out in a form suited to ready memorization and quick reference. One panel page, for instance, summarizes the points in which gas service is superior to electricity.

Now one difficulty in presenting a selling technique is that the trainee may cheerfully accept the soundness of all the principles and procedures laid down, but never pause to ask whether or not he is himself using them or whether his failure to use them is affecting his proficiency. In the B.C.G.A. course this difficulty is met by the insertion of a " check-up " sheet at the end of each chapter. It is met also by the system of Sales Cases at the end of each unit of the course. This Sales Case is really a complete selling experience; some parts of it are good, some bad. The student analyzes the Sales Case in the light of what he has just learned and applies his newly-acquired information to its problems. He has to do some original and constructive thinking. His solutions are sent up to be graded—he does not have to write long " examination paper " answers; only to indicate his selection of one out of two or three suggested replies—and he receives an analysis of the Sales Case which enables him to clear up in his mind any mistakes he may have made.

Another feature of the course is the student-salesmen's meeting, at which a " group leader " is provided with a manual for conducting the meeting, asking questions, and encouraging discussion. Demonstrations of selling methods are called for, and in this way the salesmen learn to put their knowledge into operation.

Since the inauguration of the course, a supplementary handbook has been issued dealing with gas technology from the special point of view of the salesman. In addition, the Course has been linked up with the examinations in technical subjects of the Institution of Gas Engineers and the City and Guilds of London Institute.

Diplomas are awarded on the successful completion of the courses. About 1,300 students have already gained certificates of various grades. Many more have been enrolled. There is not the slightest doubt that the course has had a tonic effect on the salesmen and saleswomen who have taken it. In fact, many of them have written to say that they enjoyed the instruction; and some of them remark, significantly, that they have felt an access of confidence in pushing the sale of the more expensive appliances.

It will be realized that such a course would not be prepared or conducted cheaply, and the cost had to be met by the fees of students. Most undertakings have gladly assisted their salesmen in the payment of fees. One executive said: " The question is not: Can we afford it? The question is: Can we afford to be without it? "

Others have reported that complete confidence replaced hesitancy in selling, and that the course has been specially helpful in increasing " second sales " and the presence or absence of the " repeat order " is the acid test of salesmanship.

Fitters and Their Public Relationships.

Perhaps the best evidence of the value of the course has been the demand for a similar scheme for training fitters in public relationships. It had been realized for some time that much might be done to help the maintenance and installation staffs to capitalize their special opportunities for fostering the goodwill of consumers and for increasing the demand for gas service. The fitter is the best-known point of contact between consumer and undertaking; and the consumer's attitude towards gas in general and his own undertaking in particular is necessarily coloured by the degree of courtesy and helpfulness which the fitter displays.

In 1933, therefore, the B.C.G.A. Domestic Gas Salesmanship scheme was developed to include a course of six informal addresses specially prepared for fitters. The Addresses, delivered by a special staff of lecturers, fall under the following general titles:

Service and Its Effects on Sales.
Installation that Makes Satisfied Consumers.
Maintenance and Inspection from the Consumer's Viewpoint.
Your Relations with the Consumer.
The Right Use of Opportunity.
Co-operation for Still Greater Success.

Accounts of authentic incidents are included in these addresses, which are followed by a period for questions and informal discussion. Many undertakings have already testified to the value of the scheme. It focusses attention on the more intangible but none the less real factors of consumer goodwill.

The Value of a Census Scheme.

The success of this Course is sufficient evidence of the importance which we attach to the work of installation fitters, complaint fitters, and maintenance men. They are largely responsible for the permanent satisfaction of our consumers. Every out-of-date and inefficient appliance on the district is a danger-point, an opening for a competitor to step in and give a better result. The only way to eliminate these danger-points is to have an efficient system of maintenance and inspection, to follow after efficient installation.

Many British undertakings have maintenance schemes under which they send men periodically to the premises of every consumer to inspect, clean, and overhaul all gas appliances installed. The advantage to the consumer is obvious. It is obvious also that maintenance may lead to an increase of business, partly through the satisfaction arising from the efficient appliance and partly because the representatives of the undertaking under such a scheme gain the privilege of welcome access to the consumer's premises, otherwise often difficult or impossible to secure.

In several cases a clear distinction is drawn between the functions of maintenance and inspection. The maintenance man is regarded in these cases as a workman pure and simple, able to give the consumer a certain amount of advice and assistance, but capable also of maintaining an appliance which is no credit to the Industry because it may be inadequate, or out of harmony with the surroundings. The inspector or examiner, on the other hand, must unite good judgment, long experience, and superior intelligence to his necessary qualifications as a craftsman. In short, he is a technically-qualified salesman. He must not allow the consumer to be satisfied with anything short of the best that the Industry has to offer.

The call of the examiner is preceded by a letter from the sales department. He must when he is on the premises light up and test all appliances, and recommend and arrange for any exchanges or repairs. He must also " take a census " of certain details regarding the consumer's premises and appliances; these are entered on a card which becomes the basis for future canvassing campaigns, serving as a target to be fired at until success is obtained, or until the consumer dies or leaves the district. Thirdly, the examiner will try diplomatically for orders. He has been chosen partly for his diplomatic powers; and he is warned before he starts work that he must never convey the false impression that he has been sent out merely to solicit orders.

The value of such a census scheme has been proved up to the hilt. Not only does it provide a complete record which serves as the groundwork for all subsequent sales activities; not only does it increase the goodwill of consumers; it also pays its way by the immediate sales which are secured. The total cost of carrying out a complete census in Preston (Lancashire) was more than covered by the net profit on the sales of appliances. A single concrete instance from the Gas Light and Coke Company may illustrate the point. An examiner in the course of his duties called at a private hotel and overhauled the gas apparatus, which proved to be in an unsatisfactory condition. The proprietor asked that this man should be allowed to inspect the gas equipment at other hotels which he owned in other districts of the Company's and all the kitchen apparatus was brought up-to-date. The man found, however, that there were only four gas fires and heaters in all the seven hotels he visited. But by this time he had gained the full confidence of the proprietor; and at the finish he took an order for 461 gas fires and 457 check meters on hire. Every piece of the apparatus thus fixed is in the eye of the public as a continuous advertisement. All this arose out of the examiner's first call and inspection of the plant at one of the hotels.

(*To be continued.*)

The Application of Town Gas to Industrial Heating Problems

The first part of the paper is the same as that read before the Manchester District Association of Gas Engineers and Managers on Oct. 26—see "JOURNAL" for Oct. 31 last, p. 369.

From a paper before the Manchester and District Junior Gas Association, Nov. 7, 1934.

By G. H. F. Windiate and E. B. Craddock, of the Stretford and District Gas Board

The plant and equipment described below were installed at the works of the Lancashire Dynamo and Crypto, Ltd., in February, 1929. It was stipulated that the complete change-over to gas and air blast in some parts of the works and to low-pressure gas in others should be carried out and completed during one week-end. The work was started at 12 noon on the Saturday, the two gas and air mixers installed and connected, considerable alterations carried out on the existing pipe services, all new burners fitted, and the entire plant was ready for running under normal conditions by 7 a.m. on the Monday morning.

The equipment installed consisted of one Selas patent automatic gas and air mixing apparatus complete with direct-coupled 3-H.P. electric motor, to serve the whole of the works with the exception of the brazing shop. This machine is capable of dealing with any quantity of gas up to a maximum of 3,000 c.ft. per hour *plus* the requisite volume of air, and the air-gas mixture is supplied at a controlled delivery pressure of 32-in. water gauge.

Owing to the special conditions of heating required in the brazing shop, a separate gas and air mixing apparatus was installed to serve that department only. This machine complete with 2½-H.P. direct-coupled electric motor is capable of supplying any quantity of gas up to 1,500 c.ft. per hour, *plus* the requisite volume of air, and supplies the air-gas mixture at a controlled delivery pressure of 3 lbs. per sq. in. This machine is situated some distance from the brazing shop and on account of the brazing work being of an intermittent nature a distant control switch for the motor, operated from the department it serves, is provided for the purpose of putting the apparatus into operation as and when it is required.

Both the gas and air mixers are supplying a mixture consisting of 40% gas and 60% air, the proportioning valves of the apparatus automatically govern the volumes of gas and air entering the machines precisely in accordance with the demands on the plant, and constant air-gas ratios are maintained under all conditions. The gas supplied has a calorific value of 500 B.Th.U., and its air-gas ratio is 4·45 to 1, giving a final calorific value of 92 B.Th.U. of theoretically correct combustible mixture at the point of ignition. The air-gas mixture supplied from the gas and air mixers has a calorific value of 200 B.Th.U. This partial mixture is of a non-combustible nature until leaving the injector jets of the burners, where the additional air necessary to form a perfect combustible mixture is induced by the kinetic energy of the partial mixture as it flows from the burner jets.

In the tool room is a Brayshaw No. 2 high-speed steel furnace, with a consumption of 400 c.ft. of gas per hour, and a Brayshaw oven type furnace with a consumption of 375 c.ft. of gas per hour.

The equipment installed in the brazing shop consists of six Selas new type double-cone high-temperature brazing blowpipes, each having a maximum consumption of 275 c.ft. of gas per hour. These blowpipes are used for the brazing of rotors of electric motors of all sizes. To these and to all other burners mentioned there is a single pipe line supply of air-gas mixture so that burner control has been simplified as far as possible.

Insulin Drying Oven.

The insulin drying oven which is used for processing laminated stampings for electric motor and dynamo rotor and core plates after spraying with insulin—a mixture of china clay and size in water—was formerly a steam-heated unit and was converted to gaseous firing early in 1932. It comprises a continuous chain conveyor passing through a lagged sheet-steel oven, 29 ft. 6 in. long and 5 ft. 9 in. wide, mounted on a brick chamber which contained the original steam heating units.

The conveyor is composed of twenty-two light chains spaced at 3-in. centres running the length of the oven proper and extending 4 ft. 6 in. at each end for charging and discharging. The stampings are laid flat on the conveyor and sprayed immediately before entering the oven by a swinging arm spray, operated by the conveyor motor. The work is discharged perfectly dry, and with a clean porcelain finish.

The gas burner equipment installed consists of four 1-in. burner tubes drilled with double rows of ⅛-in. holes at 1-in. centres; injectors are not necessary as the premixed air-gas is used. The burners are spaced at 19-in. centres and are situated near the centre of the oven. The burner equipment was designed to give a maximum temperature of 500° F. but is generally set to work at 310° F. minimum and 325° F. maximum, utilizing thermostatic control of the direct rod type. The products of combustion are vented at both ends of the oven by natural draughts. Dust extraction gear is installed above the spraying chamber and does not interfere with the draught conditions of the oven.

When gas firing was adopted for the process, a plate was fixed just above the steam coils, forming a bottom to the oven some 10 in. below the conveyor return. The burners are placed above this bottom plate below the conveyor, and protection shields are provided 3 in. above the burners to prevent insulin falling from the chain and blocking the burners. Cleaning is now a matter of scraping the bottom plate every month—a simple operation compared with cleaning the steam coils. The following further details are of interest:

(1) The plates which are dried in the oven are of a variety of shapes and vary in thickness from 0·015 in. to 0·0625 in.

(2) Baffle plates are fitted at intervals along the interior of the oven and are carried from the top of the oven to within 2½ in. of the roller conveyor, the object being to bring the hot gases immediately over the surface of the plates for the whole length of the oven. This was considered advisable since the depth of the oven from the conveyor to the inside of the oven top is some 17 in.

(3) The conveyor speed before the change over was approximately 6 ft. per minute, and has since been increased to a minimum of 9·5 ft. per minute. The normal speed is 12 ft. per minute.

The throughput of the oven is 1 ton of products per day of eight hours. The estimated steam cost per hour for heating the oven was 4·9d., and the cost of gas for a greater output is now 3·25d. per hour.

This conversion illustrates the possibility of savings to be effected by conversion from steam to gaseous heating where existing appliances are suitably constructed and well insulated.

Discussion.

Mr. F. A. RHEAD (Wallasey) asked for an explanation of "lead freezing" burners which term appeared paradoxical. It was explained that these burners are used to prevent the hardening (or, as it is termed, "freezing") of the lead on the spouts of receptacles, &c.

Mr. N. PARTINGTON (Oldham) asked if the question of the temperature of the gas at the works and the temperature of the gas at the consumer's meter was taken into consideration in fixing keen selling prices for gas, and the reply was in the negative.

The PRESIDENT (Mr. J. Carr) spoke of the advisability of encouraging the industrial load. Stretford had done a large

amount of pioneer work in connection with industrial heating, but many of the small gas undertakings could not afford the expense involved. Hence the necessity for supporting the Industrial Gas Centres, which would undoubtedly prove beneficial to all by a pooling of resources.

Mr. H. PLATT (Bolton) asked if there were any furnaces for preheating the gas. He was informed that there were several, but in practice it was not found to be an economic proposition to adopt them owing to the additional cost entailed unless it was a continuous furnace.

Mr. J. FLETCHER (Wallasey) inquired regarding the prices charged by Stretford and District Gas Board.

Mr. WINDIATE explained that the price charged for industrial gas was based on two factors—viz., (*a*) a demand charge, based on maximum demand which varied each quarter, and (*b*) a commodity charge.

London and Southern District Junior Gas Association

Twenty-Second Annual Dinner

An Annual Dinner which ranked as one of the most enjoyable for many years was that of the London and Southern District Junior Gas Association, held at the Empire Restaurant, Victoria, S.W. 1, on Friday, Nov. 16, under the Presidency of Mr. F. C. SMITH, F.C.S., of the Gas Light and Coke Company.

The success of the function was contributed to alike by an excellent muster of members and their ladies, a popular President, many distinguished guests, versatile speeches, and a concert programme which all agreed was admirable.

The distinguished guests at the top table, supporting the President and other members of the Council of the Association, included Sir Francis Goodenough, C.B.E. (Executive Chairman of the B.C.G.A.), Mr. Stephen Lacey, B.Sc., M.Inst.C.E. (Junior Vice-President of the Institution of Gas Engineers and President of the Southern Association of Gas Engineers and Managers), Mr. J. R. W. Alexander (Secretary of the Institution), Mr. A. H. Andrews (Joint Manager of the South Metropolitan Gas Company), Mr. W. Grogono (Engineer of the Croydon Gas Company), Mr. E. L. Nicholas (Engineer, Manager, and Secretary of the Guildford Gas Light and Coke Company and President-Elect of the Southern Association of Gas Engineers and Managers), Mr. R. J. Milbourne (Patron of the Junior Association and Donor of the Milbourne Medal), and Dr. J. N. Long (Principal of the Westminster Technical Institute).

The Loyal Toast having been honoured,

Sir FRANCIS GOODENOUGH, C.B.E., proposed "The London and Southern District Junior Gas Association," coupling with it the name of their President. He was very pleased to be with them on that occasion for two reasons—first, because he was always interested in the progress of the Junior Associations, and secondly, because their President was an old colleague of his and one for whom he had always held the highest regard and for whom he had prophesied a successful career. Associations of this sort existed, he said, for co-operation for mutual education and improvement. Young men beginning their careers in the Gas Industry had every reason to regard their and its future with confident optimism, as never in its history had the education and training of gas engineers and managers of the future been better organized and conducted than it was to-day, and never had the value to the nation of the services the Gas Industry could render in home and in factory been better appreciated or their steady development been more assured than in 1934; but this, he added, depended more than ever on the realization by the young men in the Industry of the truth that every man's success depended upon his individual effort, on the steadfast development and energetic application of every one of his personal gifts and abilities, and on the intelligence, interest, initiative, imagination, and industry of each one. Those were the five "I's" that made for the "I" in every individual, for the success that depended not merely upon the brain but upon the character and personality of each man.

Commerce was a fine profession if regarded as a service to the other party to the transaction and as an interesting and exciting game to be played "on the square," according to fair rules and on the centuries-old and ever worthy principle of "do unto others as ye would that others should do unto you." And remember, Sir Francis concluded, that that principle applied not only to their treatment of customers but of everyone with whom they had personal relations in business, over the counter, over the telephone, or through the letter-box—*i.e.*, whether by the spoken or written word. Courtesy and consideration were as valuable assets in business as in private life and brought their own reward—materially and spiritually, and very generally in both ways. Because this Association stood for mutual co-operation and mutual help, Sir Francis had the greatest pleasure in proposing the toast of the Association and in coupling with it the name of their President.

A Great Industry.

The PRESIDENT, responding to the toast, said they were fortunate in having in their midst Sir Francis Goodenough, whose work for the Industry was well-known to them all. The unification of the Industry's commercial activities in the organization known as the British Commercial Gas Association was very largely due to the able leadership of Sir Francis. They were particularly proud that he should be a Patron of their Association.

Turning to the work of the Junior Gas Association of this country, he felt there was never a time when such organizations were more necessary than they were to-day. The Junior Organizations enabled men in the various branches of the Industry to gather together, exchange their knowledge, and talk over their experiences. The Junior Associations were in reality a fellowship of men who were earnestly seeking to do their best for the Industry they served and make themselves worthy to occupy positions of greater responsibility in the future. It was pleasing to be able to state, continued Mr. Smith, that the London and Southern District Junior Association had a total of 471 members, and he was informed by the Hon. Secretary that there were further applications to come before the Council at the next meeting. It was likely, therefore, that their total membership in the near future would reach the 500 mark. He went on to refer to the institution of Student Membership to enable students who had not the educational requirements necessary for Associate or full Membership—but who were affiliated to a recognized class in gas manufacture or supply—to attend the meetings of the Association while they were studying for these qualifications. Although this scheme had only been in operation for two or three weeks, 45 students had already availed themselves of the opportunity, and there was reason to believe that there would be approximately 100 student members before the present session was closed. So their total membership, including student members, was 516.

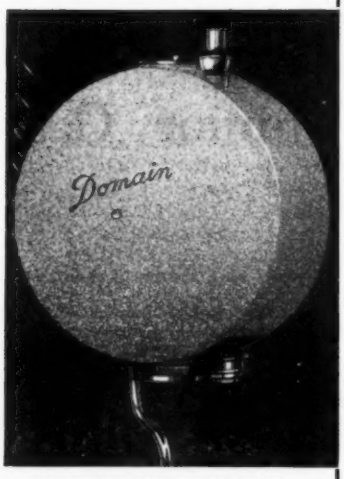
Their Association was much indebted to the Seniors who took so great an interest in their work and afforded them opportunities of visiting works and inspecting plant of special interest. They were also indebted to the firms who also allowed them to inspect their works, and to get a first-hand appreciation of the processes involved in the manufacture of the appliances used in the Industry. In conclusion, Mr. Smith paid tribute to the work of their Hon. Secretary (Mr. F. H. Higton). Only those who came into contact with Mr. Higton realized the tremendous amount of work he put in for the Association.

"The Visitors."

To Mr. J. M. WEBBER (Croydon), the Senior Vice-President, fell the proposition of the toast of "The Visitors," in the course of which he extended on behalf of the Association a most cordial welcome to all their guests, who did so much to make the evening a success. The Association much appreciated their presence—all the more because they knew that many of them had to fulfil so many engagements. Having made reference in turn to each of their distinguished guests, Mr. Webber said how pleased they were also to have with them the representatives of the Technical Press, for, as Juniors, he observed, it did not matter so much what they did as what other people heard they did. They had very firm friends in the Press, whom they were always pleased to see at their functions.

They were called "Junior Associations," went on Mr. Webber, and this was the only respect in which their chiefs envied them. But they never forgot how much they owed to their Seniors for the way they helped them. They allowed members to read papers, they threw open their works for them, gave them leave to make visits—and, what was more, while they were away on those visits "they never let London down!" This support, which had never failed, was one of the chief reasons for the success of this Association during the thirty years it had been in existence; and he believed that that support was largely due to the fact that most of the men who were now at the top of the tree and held the senior positions in the Industry were once enthusiastic Juniors themselves. Having emphasized how glad the Association were to have the ladies with them that night, Mr. Webber gave the toast of "The Visitors," with which he coupled the name of Mr. Stephen Lacey.

Mr. STEPHEN LACEY, replying to the toast on behalf of the visitors, assured them that the Seniors did take a great interest, as Sir Francis Goodenough had said, in the Junior Associations. He congratulated them in the increase in their membership and on the vitality of their Association. One of the great advantages of this Association was that it brought together the manufacturing, distribution, and commercial sides of the Industry. The Gas Industry, remarked Mr. Lacey in conclusion, largely existed to serve ladies; they were the beginning and the end of the Industry. All there that night had thoroughly enjoyed the Association's hospitality and the delightful concert, and he thanked them very much.



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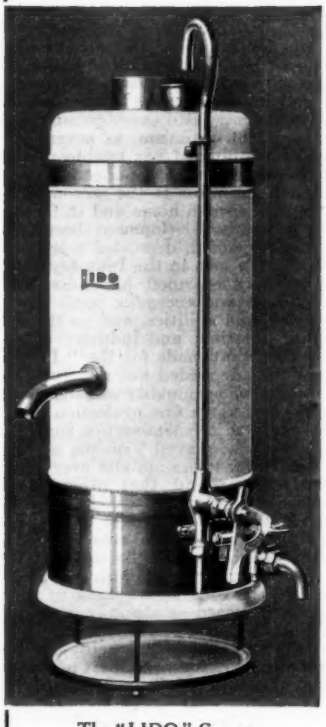

The "LIDO" Geyser.

MAIN

Falmouth Gas Company's Order

Gas Regulation Act Application

Mr. J. F. RONCA (Director of Gas Administration) held an Inquiry at the Offices of the Board of Trade in London on Nov. 9, concerning the draft Special Order which is being promoted by the Falmouth Gas Company under the Gas Regulation Acts. Mr. H. Royston Askew represented the Falmouth Company, and the Hon. H. Hope (Barrister) represented the only opponent—namely, the Penryn Gas Company.

Mr. ASKEW, explaining the position, said the Order proposed to confer on the Falmouth Company various powers of a miscellaneous nature and also proposed to authorize the Company to acquire some additional land for gas-works purposes. Having briefly outlined the development of the Falmouth Company, he said that it was in 1923 that the Penryn Gas Company first came on the scene. At that time it was a non-statutory Company supplying a very small quantity of gas; but in that year it applied to the Board of Trade for a Special Order giving it statutory powers, and, at the same time, it asked that the limits of supply should include what was known as the Budoch rural area which was within a circle of half a mile from the Penryn Town Hall and within the limits of supply of the Falmouth Company. The Falmouth Company objected, and although the Board of Trade granted the Special Order to the Penryn Company it deleted the Budoch rural area.

The position at the present moment, therefore, was that the limits of supply of the two Companies adjoined, but the Penryn Gas-Works were actually situated in the Budoch rural area within the Falmouth Company's area of supply, and the Penryn Company had for some time supplied that small area with gas. The Falmouth Company did not supply any gas in the Budoch rural area and never had done.

Gas Storage.

During the past six years, continued Mr. Askew, the annual output of gas by the Falmouth Company had increased from 76 million c.ft. to 94½ million c.ft., and, of course, the maximum day's output had correspondingly increased, with the result that the time had come when the Company must have more land. In the matter of storage of gas the position was acute, because the total storage capacity at the moment was only 219,000 c.ft. while the maximum day's output in December, 1933, was practically 413,000 c.ft., and, as all the indications were that the output of gas would still further increase for this year, it would be appreciated that the Company was existing on a storage capacity which was almost unsafe in its margin—representing barely twelve hours of the maximum twenty-four hours' demand. As regards gas-making plant, the Company at present had sufficient carbonizing plant, although it was in a congested area; but in the matter of purifying, washing, scrubbing, and condensing plant a very small increase in demand would necessitate the reconstruction of the plant and the provision of additional land. That could only be done by extending out into the river, making a sea-wall and filling in behind it which would involve a heavy burden on the Company owing to the cost of reclamation. Therefore, it was proposed to acquire an additional site at Ponsharden near the end of the Company's area.

The Hon. H. HOPE, for the Penryn Gas Company, here stated that the Penryn Company did not now dispute that the proposal to acquire the new site was a reasonable one.

Mr. ASKEW said it would be possible to do something by way of extension on the existing site, but any further extension in the tar distilling and other plant, as well as increased storage, must go to the new site, which was conveniently situated with a river frontage and was near the main road. There were no other objections to the proposal than that by the Penryn Company, but that had been modified by what Mr. Hope had just said, and there was no objection by that Company now to the site, as a site.

Continuing with regard to the opposition by the Penryn Company, Mr. Askew said the Falmouth Company applied for this Order in 1933, the Penryn Company deposited an objection, and the Board of Trade fixed the Inquiry for last November. Negotiations, however, took place, and it was hoped that there might be a settlement, as the Penryn Company had stated they were prepared to take immediate steps to promote a Special Order asking for an extension of their limits of supply to include the Budoch rural area, which they were at present supplying but which was in the area of the Falmouth Company. As a matter of fact, nothing had been done in this matter, and the Falmouth Company held the view that the present Special Order should be delayed no longer.

Dealing with the objection to the Order, Mr. Askew said the position now taken by the Penryn Company was that it should be " safeguarded " in the Budoch rural area against competition from the Falmouth Company, although the Budoch rural area was actually in the Falmouth Company's area. However, the Falmouth Company had never supplied in that area and was willing to insert a clause in the present Order to the effect that in the event of the Penryn Company applying for statutory powers in that small area before July 31, 1935, and obtaining these powers, then the powers now held by the Falmouth Company in that area should cease. Alternatively, as there might be some difficulty in inserting such a clause in the present Order, he was prepared for the clause to provide that the Falmouth Company should not oppose an Application by the Penryn Company for these statutory powers.

Position Should be Regularized.

The Hon. H. HOPE said that the position of the Penryn Company briefly was that for approximately 80 years it had been supplying to a certain number of premises in the Budoch rural area, and in 1933 there were 33 consumers which were admittedly outside the Company's own statutory limits, who consumed 656,000 c.ft. of gas out of a total of 3,024,300 c.ft. of gas, or approximately one-sixth of the total. The number of consumers represented 10% of the total number of consumers of the Penryn Company, and therefore it was of some importance to that Company to preserve that business and if possible extend it. He frankly admitted that the Penryn Company was exposed to certain dangers and penalties by carrying on in this way, and there was some reason to urge that the position should be regularized. His submission was that apart from the strict letter of the law, the Penryn Company were the first people to develop the supply of gas in this area, and therefore there was some moral claim that that portion of their Undertaking should be safeguarded. In regard to what had been said as to the Company not applying for a Special Order last year, the position was that in 1931 the Company made a loss of £39; in 1932 there was a further loss of £164 and in 1933 there was a profit of £50, and quite frankly the Company had not the money to promote a Special Order.

The DIRECTOR: What do you mean by " safeguarded "?

The Hon. H. HOPE replied that if the Falmouth Company extended its mains into the Budoch rural area, it would compete with the Penryn Company.

The DIRECTOR: Suppose they do, how are you to be safeguarded?

The Hon. H. HOPE said he asked simply that a clause should be inserted in the present Order reducing the Falmouth Company's area of supply by taking away the Budoch rural area, and then the Penryn Company could apply for fringe Orders under Section 5 of the Act of 1929 with regard to the specific consumers in this area.

The DIRECTOR remarked that if the area was taken away from the Falmouth Company in the manner suggested, it would be a non-statutory area, and there was no power on the part of the Board of Trade to grant fringe Orders in such circumstances.

Mr. ASKEW said the position now resolved itself into a request by the Penryn Company that the Falmouth Company should undertake not to extend its mains into the Budoch rural area and that the Penryn Company would undertake to apply for fringe Orders in respect of any houses now supplied or hereafter requiring a supply of gas in that area. The reply to those suggestions, however, was quite simple. In the first place, the Falmouth Company could not undertake, as a statutory undertaking, not to exercise statutory powers because any such agreement would be *ultra vires*. In the second place, there was nothing in the world to prevent the Penryn Company from applying for fringe Orders, one by one, in respect of the properties now supplied in the Budoch rural area, but this had not been done.

At this stage there was a short adjournment while the parties conferred on the position, and when they returned, Mr. ASKEW said that the Falmouth Company was prepared to give an undertaking not to oppose applications by the Penryn Company under Section 5 of the Gas Undertakings Act, 1929, for fringe Orders, authorizing the Penryn Company to supply the consumers now being supplied within the limits of supply of the Falmouth Company. That undertaking, added Mr. Askew, the Falmouth Company was prepared to give at once.

The Hon. H. HOPE said that having regard to the remarks made by the Director as to the difficulty of granting fringe Orders if this area was taken away from the Falmouth limits of supply, he had obviously been put in a difficulty, and therefore felt that the offer made on behalf of the Falmouth Gas Company was one which should be accepted, and in the circumstances he withdrew his opposition to the proposed Order.

The DIRECTOR commented on the fact that the proposed undertaking related only to existing consumers.

The Hon. H. HOPE said he was afraid that nothing could be done at the moment to safeguard anything that the Penryn Company might like to do in the future as regards other premises, and that he could not expect the undertaking to go farther than it did.

The DIRECTOR having pointed out that the undertaking which had been agreed upon would be outside the Order and could not be embodied in it, the inquiry then closed.

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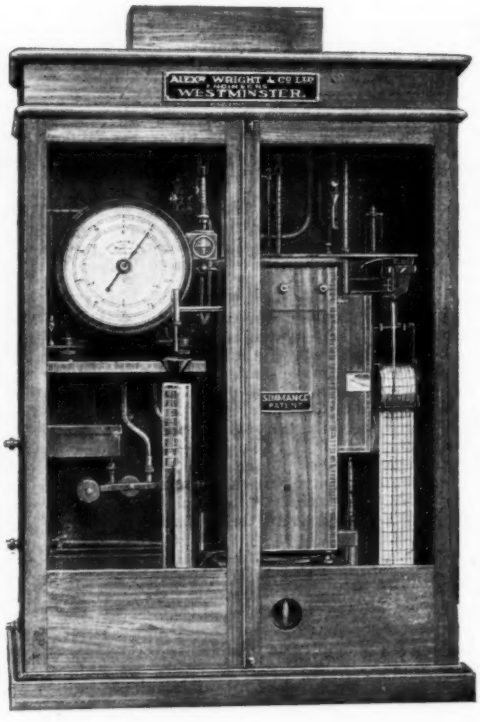

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Gas Markets and Manufactures

Stock Market Report.

[For Stock and Share List, see later page.]

It is some time since the Stock Exchange experienced such activity as prevailed during last week. In addition to the large buying by investors, a speculative movement set in and increased as the week progressed, with the result that many prices, particularly in the industrial section, reached new high levels and have already discounted any anticipated improvements in dividend distributions. The gilt-edged market was as firm as ever, though at one time profit-taking sales caused some slight hesitancy. All British Funds, however, closed considerably higher on the week, the feature being a rise of 5¼ to 91½ in 2½% consols.

The Gas market was no exception to the general conditions, and prices continued to forge ahead. In fact it is not since the Government's successful conversion operation in 1932 that such a large number of issues have appreciated in one week, but whereas at that time the movement was almost confined to the fixed-interest stocks, to-day all classes of stocks are participating, so much so that in the case of the leading companies the yields on ordinary issues are only about 10s.% more than that obtainable on debenture stocks. Among the large number of rises last week the following were the chief features: Gas Light units with a gain of 9d. to 29s. 3d.; South Shields consolidated, which was moved up 11 to 184 on the Newcastle Exchange; Maidstone 3% debenture, with a rise of 9 to 86½; and South Suburban ordinary, which gained 8 to 142½.

The Directors of the Severn Valley Gas Corporation have offered for sale by tender 100,000 4½% cumulative preference shares of £1 each and 135,000 ordinary shares of £1 each, at a minimum price in both cases of 22s. per share. At this price the yields work out at £4 1s. 9d.% and £4 10s. 10d.% respectively. The Corporation is a holding company, incorporated in March of this year, and has acquired or is acquiring interests in a number of companies in the districts of Cheltenham, Gloucester, and Stroud. The prospectus shows that, after providing for the dividend on the preference shares, the estimated amount available would be £15,007, of which £11,416 is required to pay a 5% dividend on 228,314 ordinary shares issued or to be issued. Interim dividends at the rates of 4½% per annum on the preference shares and 5% per annum on the ordinary shares were paid on Oct. 1 last for the half-year ended Sept. 30.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Nov.* 19.

There is little of interest to report in the tar products market, with prices steady at about the following figures:

Pitch, 52s. 6d. per ton f.o.b.

Creosote is firm at 4¼d. to 4½d.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, about 2s. 2d.; pure benzole, 1s. 9d. to 1s. 10d.; 95/160 solvent naphtha, 1s. 7d.; and 90/160 pyridine, 6s. to 6s. 3d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Nov. 19.

The average prices of gas-works products during the week were: Gas-works tar, 21s. 6d. to 26s. 6d.; Pitch—East Coast, 47s. 6d. to 50s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 47s. 6d. to 50s.* Toluole, naked, North, 1s. 6d. to 1s. 8d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 4½d. Heavy naphtha, North, 9¾d. to 10¼d. Creosote, *ex* works, in bulk, North, liquid and salty, 3⅝d. to 3⅝d.; low gravity, 3⅝d. to 3⅝d.; Scotland, 3¼d. to 3½d. Heavy oils in bulk, North, 3½d. to 4¼d. Carbolic acid, 60's, 1s. 8d. to 1s. 9d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Nov.* 17.

Conditions remain quiet in this area. Actual quotations show no material alteration, although, if anything, there is an easier tendency.

Crude gas-works tar is 30s. to 32s. per ton *ex* works in bulk.

Pitch.—Export business is decidedly dull. Values are still called 43s. to 44s. per ton f.o.b. Glasgow for export and 42s. 6d. per ton *ex* works in bulk for home trade.

Refined tar is offered freely at 3d. to 3⅛d. per gallon naked at makers' works for prompt and forward delivery.

Creosote oil.—Position is uncertain, but quotations are unchanged. B.E.S.A. Specification, 3¾d. to 4d. per gallon; low gravity, 4¼d. to 4½d. per gallon; and neutral oil, 4d. to 4¼d. per gallon; all f.o.r. in bulk.

Cresylic acid is quietly steady. Pale, 97/99%. is 1s. 2½d. to 1s. 3½d. per gallon; dark, 97/99%, 1s. 0½d. to 1s. 1½d. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon; all *ex* works.

Crude naphtha commands 4½d. to 5d. per gallon, according to quality, as available.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, while 90/190 grade remains nominal at about 8d. per gallon.

Motor benzole.—1s. 5d. per gallon (nominal).

Pyridines.—90/160 grade is 6s. to 6s. 6d. per gallon, and 90/140 grade 6s. 6d. to 7s. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9	to	0	9½	per gallon at works
Motor "	1	3½	"	1	4	" " "
90% "	1	4	"	1	4½	" " "
Pure "	1	7¼	"	1	8	" "

Trade Notes.

Gas Boiler Makers' Extensions at Accrington.

Additional employment will be provided at Accrington by Messrs. H. Slack & Sons, gas boiler manufacturers, who have taken over a section of the commodious Broad Oak Mill, Church Street, for the manufacture of gas boilers. This, of course, is in addition to their existing works at Grange Lane.

New Coking Plant for Yorkshire.

Messrs. Gas Chambers and Coke Ovens, Ltd., of Artillery House, Westminster, S.W. 1, have just received a contract to build ten Collin regenerative coke ovens for the Yorkshire Coking and Chemical Company, Ltd., Castleford, Yorks.

Contracts Advertised To-Day.

Boiler.
Rhyl Gas Department. [p. 638.]

Condenser.
Rhyl Gas Department. [p. 638.]

Gas Compressors.
Rhyl Gas Department. [p. 638.]

Mainlaying and Trenching.
Rhyl Gas Department. [p. 638.]

Pipes.
Rhyl Gas Department. [p. 638.]
Stockport Gas Department. [p. 638.]

Gas Undertakings' Results.

Kilmarnock.

The gas consumption in Kilmarnock increased last year by 6,135,380 c.ft., the increase during the last two years being 7,788,410 c.ft. During the past year the surplus on the net revenue account rose from £1,847 to £5,925. The Council is seeking powers generally to extend their Gas Undertaking.

Lytham St. Annes.

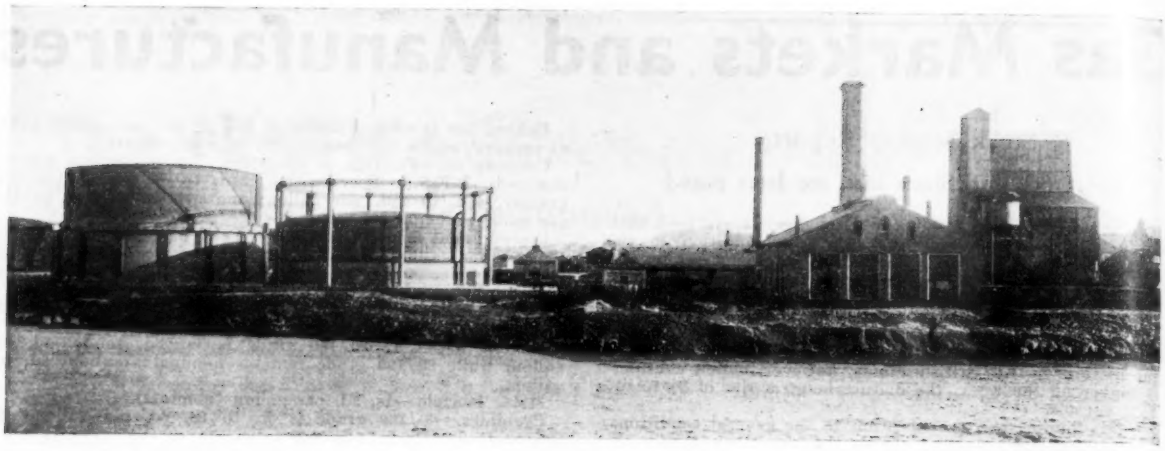
The annual accounts of Lytham St. Annes Corporation Gas Department show a gross profit during the past municipal year of £20,213, compared with £20,140 during the previous year. The net profit amounted to £1,214.

The World's Benzole Production.

Estimates by the Union Française des Producteurs de Benzols give the production of benzole in the eleven principal producing countries of the world last year as 918,400 tons, compared with 829,500 tons of 1932 and 1,019,700 tons of 1931.

Between 1932 and 1933, output in the U.S.A. increased from 270,000 tons to 320,000 tons; in Germany, from 250,000 tons to 275,000 tons; in England, from 118,000 to 119,000 tons; in France, from 68,200 to 74,200 tons; in Poland, from 17,000 to 18,000 tons; and in Holland, from 21,500 to 23,000 tons. Output in Czecho-Slovakia was stationary during the two-year period at 14,000 tons per year, the same being true for Italy (5,000 tons) and Spain (3,200 tons).

Complete reliance should not be placed in these figures, however, as in some cases they cover crude benzole and in others light oil distillation products as a class.



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1,551,868	Stk.	Sept 10	7	7	Alliance & Dublin Ord. ...	135—145	...	136
974,000	"	June 25	4	4	Do. 4 p.c. Deb. ...	90—100	...	...
557,655	"	Aug. 13	7	7	Barnet Ord. 7 p.c.	168—173	...	171
300,000	1	Oct. 8	1/9⅓	1/4⅓	Bombay, Ltd.	1⅛—1⅛	...	31/6
178,480	Stk.	Aug. 13	9½	9½	Bournemouth sliding scale	225—235	...	230
550,050	"	"	7	7	Do. 7 p.c. max. ...	170—175	+2	170—175
439,160	"	"	6	6	Do. 6 p.c. Pref. ...	147—152	+2	147
50,000	"	June 11	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
262,025	"	"	4	4	Do. 4 p.c. Deb. ...	105—110	...	...
335,000	"	"	5	5	Do. 5 p.c. Deb. ...	125—130	...	...
357,900	"	Aug. 13	7½	7½	Brighton, &c., 6 p.c. Con. ...	173—178	...	178—180
540,000	"	"	6⅔	6⅔	Do. 5 p.c. Con. ...	158—163	...	...
195,500	"	"	6	6	Do. 6 p.c. B. Pref.	142—147	...	...
1,487,500	"	July 9	5	5	Bristol 5 p.c. max.	120—122*a*	+3½	...
120,420	"	June 11	4	4	Do. 1st 4 p.c. Deb. ...	103—106*a*	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	103—106*a*	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	123—125*a*	...	...
885,000	"	Sept. 24	8	7	British Ord.	170—175	+3	170½—175
100,000	"	June 11	7	7	Do. 7 p.c. Pref.	158—163	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	98—103	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	107—115	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	2—4	...	...
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. ...	4—6	...	...
150,000	Stk.	July 23	4½	4½	Do. 4½ p.c. Deb. ...	90—95	...	...
626,860	"	July 23	6	6	Cardiff Con. Ord.	135—140	+3	136—136½
237,860	"	June 11	5	5	Do. 5 p.c. Red. Deb.	107—112	...	...
157,150	"	July 23	6½	5	Chester 5 p.c. Ord.	113—118*b*	...	...
98,986	1	Sept. 24	2/-	2/-	Colombo, Ltd. Ord.	1⅞—1⅞	...	...
24,500	1	"	1/4½	1/4½	Do. 7 p.c. Pref. ...	19/6—21/6	...	...
609,204	1	Sept. 24	/11'48	/11'48	Colonial Gas Assn. Ltd. Ord.	19/6—21/6	...	...
296,053	1	"	1/8'30	1/8'30	Do. 8 p.c. Pref.	24/6—26/6	...	...
1,775,005	Stk.	July 23	6½	5	Commercial Ord.	120—125	...	123½—124½
475,000	"	June 11	3	3	Do. 3 p.c. Deb. ...	88—92	+1½	90
286,344	"	Aug. 13	5	5	Do. 5 p.c. Deb. ...	122—127	...	...
807,560	"	Aug. 13	7	7	Croydon sliding scale ...	165—170	+3	165½
569,590	"	"	5	5	Do. max. div.	110—115	...	...
620,385	"	June 25	5	5	Do. 5 p.c. Deb.... ...	123—128	...	124—124½
542,270	"	Aug. 13	10	7	Derby Con.	192—197*a*	+2	...
55,000	"	June 25	4	4	Do. 4 p.c. Deb.	100—105*a*	...	...
209,000	"	Aug. 13	5	5	East Hull Ord. 5 p.c. ...	108—112	...	...
181,625	"	Aug. 13	6	6	East Surrey Ord. 5 p.c. ...	137—142	...	...
175,809	"	June 11	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
1,002,180	"	Sept 10	17	13	European, Ltd.	122—127	...	124—125
19,342,763	"	Aug. 13	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	28/9—29/9*f*	+·/9	28/6—29/6
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	92—95	+2	92—93
4,477,106	"	"	4	4	Do. 4 p.c. Con. Pref. ...	108—111	+1	106⅞—110
6,102,497	"	May 28	3	3	Do. 3 p.c. Con. Deb. ...	89—92	+1	89½—91
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	118—121	+1	119½—120
3,500,000	"	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	116—119	+1	117⅝—119
270,465	"	Aug. 13	6	6	Harrogate New Cons. ...	127—132	...	...
140,000	1	Sept. 24	1/7½	1/7½	Hongkong & China, Ltd. ...	14—15*	...	...
213,200	Stk.	Aug. 13	6	5	Hornsey Con. 3½ p.c. ...	137—142	...	...
5,600,000	"	Oct. 22	14	10	Imperial Continental Cap.	207—212	+5	205—211½
223,130	"	July 23	3½	3½	Do. 3½ p.c. Red. Deb.	92—97	...	...
235,242	"	Aug. 13	8½	8½	Lea Bridge 5 p.c. Ord. ...	196—200	...	...
2,147,410	"	Aug. 13	6	6	Liverpool 5 p.c. Ord. ...	140—141*b*	+1	...
245,500	"	June 11	5	5	Do 5 p.c. Red. Pref. ...	105—110*b*	...	...
306,083	"	July 16	4	4	Do. 4 p.c. Deb. ...	102—104*b*	...	...
11,751	"	Aug 27	10	*	Maidstone 5 p.c. Cap. ...	188—198	...	...
63,480	"	June 25	3	3	Do. 3 p.c. Deb. ...	84—89	+9	...
75,000	"	May 28	†10	†10	Malta & Mediterranean ...	200—210	...	...
329,000	–	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	100—103	...	...
231,278	Stk.	Aug. 13	5	5	M. S. Utility "C." Cons. ...	113—118	+2	118
818,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	98—103	+1	100
360,075	"	June 11	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
148,955	"	"	5	†5	Do. 5 p.c. Deb. ...	122—127	...	...
125,000	—	July 2		11/8	Do 3½ p.c. Rd. Rg.Bds.	97—100	...	...
675,000	"	May 28	†6	†13	Montevideo, Ltd.	60—65	...	60½
2,061,315	"	Aug. 13	6⅔	5	Newcastle & Gateshead Con.	26/—27/-*d/*	+·/6	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	105—107*d*	+2	...
776,706	"	June 11	3½	3½	Do. 3½ p.c. Deb. ...	92½—93½*d*	...	...
277,285	"	May 7	5	5	Do. 5 p.c. Deb. '48 ...	105—107*d*	...	...
274,000	"	Aug. 13	5	5	Newport (Mon.) 5 p.c. max.	106—108*a*	...	...
204,940	"	Aug. 13	7½	7½	North Middlesex 6 p.c. Con.	160—167	...	...
396,160	"	Aug. 13	5	5	Northampton 5 p.c. max. ...	107—112	...	...
300,000	"	Nov. 5	†7	†9	Oriental, Ltd.	166—171*	...	168½—170
416,617	"	June 11	8	8	Plym'th & Stonehouse 5 p.c.	178—183	...	183
504,416	"	Aug 13	8	8	Portsm'th Con.Stk. 4 p.c.Std	177—182	...	...
241,446	"	"	5	5	Do. 5 p.c. max. ...	105—110	...	...
114,000	"	July 23	5	5	Preston 5 p.c. Pref. ...	101—106	...	...
1,736,968	Stk.	Aug. 27	6	6	Sheffield Cons.	141—143*e*	+1	...
95,000	"	July 9	4	4	Do. 4 p.c. Deb.	100—104*	...	...
133,201	"	Aug. 13	5	8½	Shrewsbury 5 p.c. Ord. ...	149—154	+4	149½
90,000	10	May 28	‡4	‡8	South African	2—4	...	...
927,177	1	Sep. 10	1/3⅔	1/2⅔	South East'n Gas Cn.Ld Ord	30/—32/-	+·/6	31/3—31/9
736,061	1	"	-/10⅔	-/10⅔	Do. 4½ p c. Red.Cum.Pref.	22/6—23/6	+·/6	23/6
450,000	Stk.	Aug. 13	74/4	4	Do. 4 p.c. Red. Deb. ...	102—105	...	...
6,709,895	"	Aug. 13	7	6	South Met. Ord.	150—155	+5	149—154
1,135,812	"	"	6	6	Do. 6 p.c. Irred. Pf.	148—153	+3	149—158
850,000	"	"	4	4	Do. 4 p.c. Irred. Pf.	107—110	+3	106½—109½
1,895,445	"	June 25	3	3	Do. 3 p.c. Deb. ...	88—91	+1	88½—90
1 000,000	"	July 9	5	5	Do. 5 p.c. Red. Deb.	116—119	+1	118
209,820	"	Aug. 13	8½	8½	South Shields Con.	183—185*d*	+11	...
1,543,795	"	July 9	6	6	South Suburban Ord. 5 p.c.	140—145	+8	140
512,825	"	"	5	5	Do. 5 p.c. Pref.	124—129	+2	125—127
300,000	"	"	4	4	Do. 4 p.c. Pref.	102—107	+1	...
868,837	"	June 11	5	5	Do. 5 p.c. Deb.	125—130	+2	126—126½
100,000	"	"	4	4	Do. 4 p.c. Deb.	102—107	...	...
647,740	"	Aug 13	6	6	Southampt'n Ord. 5 p.c. max.	117—122	+5	119½
121,275	"	June 11	4	4	Do. 4 p.c. Deb.	102—107	+3	...
350,000	"	Aug. 13	5½	5½	Swansea 5½ p.c. Red. Pref.	113—118	+1	116—117½
200,000	"	June 11	6½	6½	Do. 6½ p.c. Red. Deb.	102—107	...	105—105½
1,076,490	"	Aug. 13	6⅔	6⅔	Tottenham and District Ord.	155—165	+2½	158½—160
409,835	"	"	5½	5½	Do. 5½ p.c. Pref. ...	130—135	...	134½
69,235	"	"	5	5	Do. 5 p.c. Pref. ...	122—127	+4	...
199,005	"	June 11	4	4	Do. 4 p.c. Deb. ...	102—107	+2	...
349,110	"	Aug 13	7	7	Uxbridge, &c., 5 p.c. ...	165—170	+2	167
88,330	"	"	5	5	Do. 5 p.c. Pref. ...	124—129	...	...
1,326,700	"	Aug. 13	7	7	Wandsworth Consolidated	165—170	+4	164½—165
1,371,373	"		5	5	Do. 5 p.c. Pref.	124—129	...	...
1,317,964	"	June 11	5	5	Do. 5 p.c. Deb.	124—129	...	...
208,304	"	"		26/8	Do. 4 p.c. Deb.	104—107	...	...
158,400	"	Aug. 13	6*g*	5	Winchester W.& G.5 p.c.Con.	120—125	...	...

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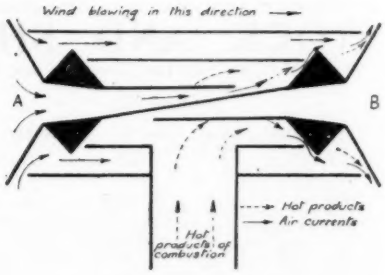

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